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approach

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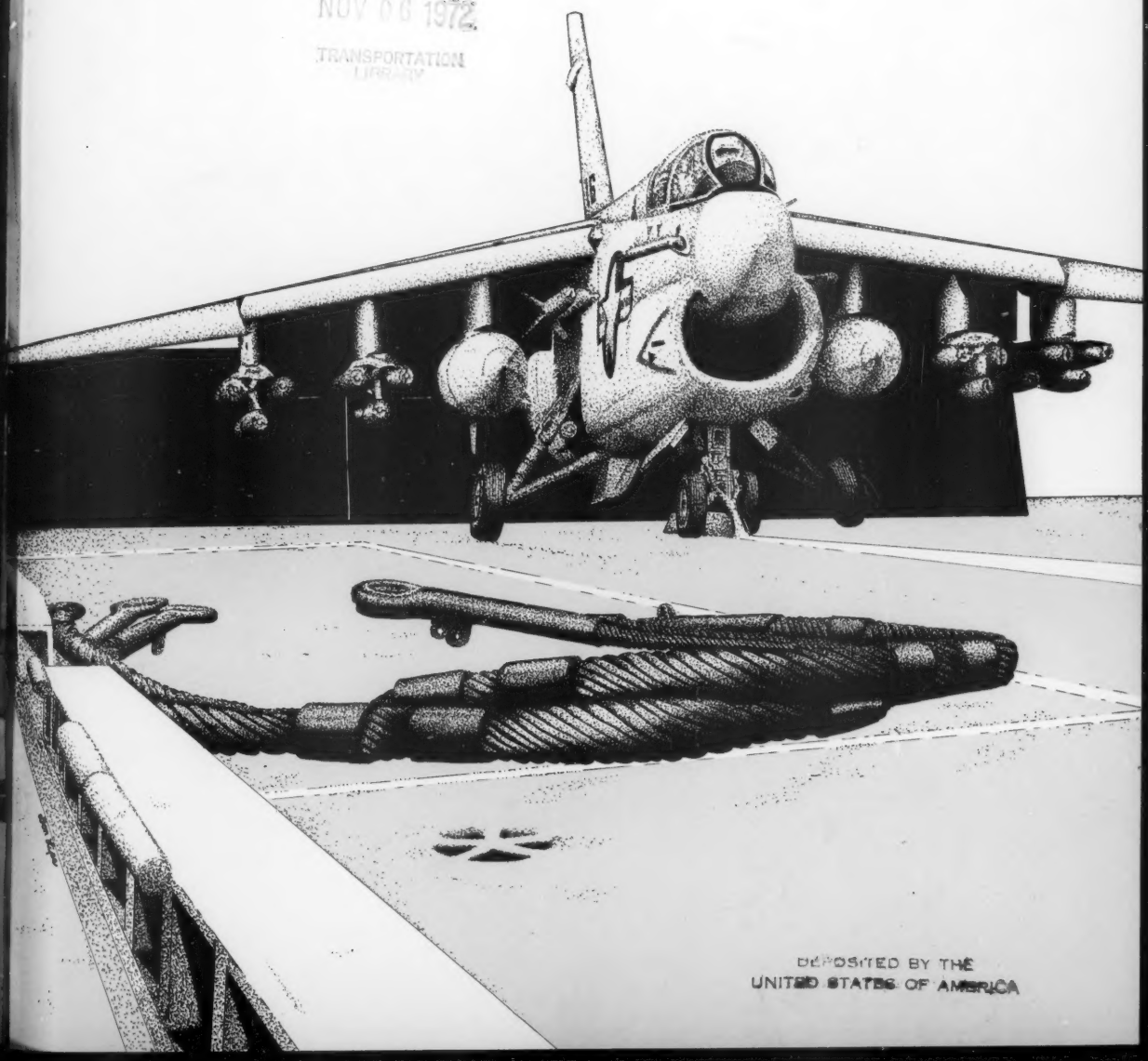

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In response to numerous requests, the author has agreed to relate his experience during an aircraft emergency in order to promote interest in the value of training and experience . . . *for safety's sake.*

No Accident!

By CDR Siegfried A. Fink

WHEN the engine begins to vibrate . . . when the propeller and gearbox tear loose and bang into the side of the fuselage . . . it's too late to *prepare* for an emergency.

When does preparation for an emergency begin? The last NATOPS evaluation . . . last week's safety review . . . the most recent flight . . . during flight training when response patterns are established . . . when you're a child learning your basic approach to life??? *(All the above.)*

Whatever the answer, you may be sure that *preparation* is essential for the successfui handling of an emergency. A case in point:

It was a beautiful, warm, clear day when we preflighted our E-2B *Hummer* and made ready to be launched from the flight deck. Destination was a land base. There were five souls onboard – pilot, copilot, and three passengers. I was the pilot.

After the aircraft was preflighted, passengers briefed, and engines checked, we were catapulted with a full load of fuel. The copilot, in the right seat, had the controls as we started our climb on course. Passing through 4500 feet, about 8 miles from the ship, we experienced a sudden, catastrophic failure which tore the propeller and gearbox from the starboard engine. When the propeller left the aircraft, it struck the fuselage behind the copilot's seat, tearing a 1- by 2-foot hole in the skin, crimping the landing gear actuation cable and severing multiple electrical wires. The engine continued to run briefly, but fire was shooting out the tailpipe due to an obvious bad case of FOD ingestion.

The flight ended onboard the carrier's flight deck minutes later without personnel injury. The aircraft proved to be a rare specimen for the aircraft accident investigators. Their investigation surfaced the mysterious source of several other accidents and should avert future mishaps of this type.

What was the *preparation* that made it all turn out so well? Let's see . . .

At the moment of failure, my first reaction was to

place the propeller synchrophaser switch in the center position while the copilot continued to fly the aircraft. Then I asked him to check the starboard propeller. He reported that we had "lost the prop." I didn't comprehend the full meaning of those words at first. The previous week I had lost partial propeller control and had stopped fluctuation by placing the sync switch in center. *(As it turned out, placing the sync switch in center position made no difference. The association with the last malfunction I had experienced didn't help.)*

Fire was reported by a passenger and simultaneously the red light glowed in the emergency "T" handle. I instinctively pulled it, and the fire went out. *(That procedure was in response to NATOPS training which was completed in the RAG three weeks earlier. Design of the warning system, a red light with the word FIRE in the handle, also contributed to the proper response since it seemed the natural thing to do.)*

We were still at 4500 feet, damage unknown. Rushing air could be heard, and a passenger reported he could see daylight through the hole in the fuselage. I directed the copilot to report our difficulty and position, and request immediate landing. Letting the ship know of the emergency gave us the priority we needed to plan the remainder of the flight. The plan was not formalized, but rather was a constant evaluation of the options.

The next question was, will the plane fly? The flaps or rudder may have been damaged, so we decided to flight check it in the landing configuration at altitude. *(Let's see . . . NATOPS didn't cover that, but I've read it several times in safety magazines like APPROACH and NAVAIR NEWS. The best stories were the hairy tales of other pilots and how they handled their emergencies. The training command taught it, too, during formation training, in case of a midair.)*

If the aircraft could not be controlled, we would have to bail out. Two-thirds flaps were lowered, and we slowed to 120 knots. Good control. *(Two-thirds flaps . . . that was straight from NATOPS for a single-engine landing. Having to recall that procedure for periodic examinations helped to crystallize it . . . just 17 days earlier those procedures had been reviewed in detail as part of the squadron's daily quiz of a NATOPS emergency.)*

I put max rudder ON. *(It was indelibly impressed on me by my RAG instructor that the aircraft would not fly on one engine without the 20 degree throw available with max rudder. He let me fall into the trap once . . . while being checked out in the aircraft, I forgot max rudder as I completed the landing checklist. Then, after I slowed to 120 knots, he simulated the loss of an engine. The aircraft yawed sideways, almost beyond control. I have never forgotten max rudder since.)*

I decided to leave the landing gear up until I was sure I could make the deck. I started a descent. We were too heavy to land with a full fuel load. We dumped fuel down to landing weight. *(Two days before, the squadron NATOPS officer and I had an informal discussion on fuel weight for a single-engine landing. Max trap weight would do, but with a lighter load it would be easier to control, he pointed out. Since his point sounded valid, we dumped down further to an estimated bingo weight.)*

The No. 1 UHF stopped working now – so did the pilot's attitude indicator. The pitch feel also malfunctioned, and the copilot ran the system manually. What caused all these failures? The essential AC bus. *(I knew these systems were on that bus. I had learned that while reviewing the NATOPS manual and rereading it while taking a comprehensive "super test" in the RAG. One can't know too much about the airplane he flies. Years of flying has impressed upon me the need to know an airplane and its systems thoroughly.)*

The No. 2 UHF and the TACAN failed. The passengers were told to "set the radios in back on tower frequency." The passengers, unfamiliar with the equipment, did well to figure that out. They had us on tower frequency after a few seconds. By then we were in a position for a straight-in approach to the carrier deck. Time to lower the gear. I tried . . . and tried again . . . but the gear handle wouldn't budge. The copilot advised the ship of the problem.

At this point the copilot noted the hydraulic pressures dropping. (Subsequent analysis revealed that only electrical power was lost to the hydraulic pressure gages. Vibration was causing the needles to slowly fall.)

By this time, we were in close to the ship. We continued into the break, still struggling with the gear handle. *(In a flash of recall, I remembered an experience in the RAG where I saw the center console dismantled on an aircraft in the hangar. The picture came to mind of the mechanical relationship between the internal working of the normal gear handle and the emergency gear handle. With this insight, the emergency gear handle came down easily, and those beautiful round wheels came out of the nacelles.)*

Now, I thought, where do we stand? We're too low to bail out . . . the gears are emergency down and cannot be raised . . . if we lose hydraulic pressure we lose flight controls . . . land as soon as possible, using minimum control movements to conserve fluid.

The single-engine approach to landing was the smoothest I have ever flown. Power was correct. I was slightly fast by choice, with line-up and glide slope control right on. *(By way of preparation, I had a "training" session 2 days previously. The propeller*

governor failed on a routine mission and resulted in securing the engine. The first approach had been rough and I was given a waveoff. By the second time around I had erred enough that I knew how to do it right.)

Wham! We picked up the No. 3 target wire and came to a reassuring stop.

Training, experience, study, review, and a good copilot make the difference when you have an emergency. When does preparation for an emergency begin? It begins when you extend yourself to learn more than is necessary to just get by . . . and it never ends!

As I reflect on this episode, I thank God for the sequence of experiences which prepared me for this flight.

This **Hummer** *driver was just about as pumped up for an emergency as anyone can be. By properly utilizing current knowledge, past experience, ancient history (training command), and periodic NATOPS training – any pilot can be as well-prepared. Need we be so trite as to say, "training pays off?" – Ed.*

CROSS-COUNTRY MISHAPS

PLANNING an extended cross-country flight? Maybe coast to coast? If so, it will pay to stop and think about some of the associated pitfalls. Usually, a pilot is anxious to reach destination as soon as possible. This often leads to:

- Long flight legs and close fuel tolerances.
- Flight through deleterious weather conditions.
- Continued flight with "minor" maintenance discrepancies.
- Inadequate servicing at enroute stops due to lack of fully trained personnel.
- Fatigue due to extended flight following a normal workday at Homebase.

Too often these factors lead to mishaps. Documentation of aircraft mishaps resulting from cross-country flights and "in and out" navigation flights is difficult. Likewise, the underlying cause factors in these mishaps are difficult to pin down. Nevertheless, it is known that many mishaps do occur. For example:

A review of mishap statistics at one favorite stopping place, Tinker AFB, Oklahoma, provides ample support for a general review of cross-country procedures. This base is a convenient mid-continent servicing stop and has adequate facilities for handling Navy/Marine Corps aircraft. However, statistics since 1967 reveal that 55 Navy/Marine Corps aircraft have been involved in accidents/incidents at Tinker!

These mishaps involved 18 different types of aircraft from T-28 to P-3, from A-4 to RA-5C. There are two burned-out hulks resulting from accidents there . . . and considerable maintenance man-hours and money were required to repair 26 other aircraft that sustained varying degrees of damage. The remainder of the mishaps also required maintenance hours, parts, and maintenance personnel travel to repair material discrepancies which initially forced the aircraft to remain on deck there.

There were a total of 14 pilot causal factor mishaps at Tinker and with only one exception, all were associated with fighter/attack aircraft. Four types of fighter/attack aircraft were responsible for 60 percent of the mishaps (F-4, A-4, A-6, A-7).

The statistics presented apply only to the *reported* mishaps at *one* cross-country base. They do not relate to the additional flight hazards and near accidents which undoubtedly have gone unreported at other bases.

Curtailment of cross-country training is not recommended. However, procedures, planning, and supervision of these flights should be periodically reviewed with the goal of increasing safety in this vulnerable phase of aircraft operation.

PIREPS (Pilot Weather Reports)

A Reminder

WHENEVER ceilings are at or below 5000 feet, visibilities at or below 5 miles, or thunderstorms are reported or forecast, FAA stations are required to solicit and collect PIREPS which describe conditions aloft. Pilots are urged to cooperate and volunteer reports of cloud tops, upper cloud layers, thunderstorms, ice, turbulence, strong winds, and other significant flight condition information. The PIREPS should be transmitted to METRO, if possible, or to the FAA ground facility with which communication is established, i.e., FSS or ARTCC.

The following procedures are applicable in making inflight and postflight weather reports:

(1) Pilot Reports will be made under the following conditions:

- Inflight when requested.
- When unusual and unforecast weather conditions are encountered.
- When weather conditions on IFR approach differ from the latest observation.
- When a missed approach is executed due to below minimum conditions.

(2) PIREP Format:

- Location
- Time (GMT)
- Phenomena reported to include:
  - (a) Any hazardous weather
  - (b) Marked wind changes
  - (c) All turbulence with intensity, duration, and proximity to clouds
  - (d) Altitude of phenomena
  - (e) Type aircraft

(3) Reports of CAT (Clear Air Turbulence). The USAF Air Weather Service operates a CAT forecasting section within the Air Force Global Weather Center at Offutt AFB, Nebraska. This section prepares and relays CAT forecasts to weather detachments for use in flight weather briefings. The CAT forecast program depends heavily on CAT information, both positive and negative, reported by pilots.

(4) Airframe icing and turbulence will be reported according to the criteria in Tables 1 and 2.

AIRFRAME ICING REPORTING TABLE

INTENSITY	ICE ACCUMULATION
TRACE	Ice becomes perceptible. Rate of accumulation slightly greater than rate of sublimation. It is not hazardous even though de-icing/anti-icing equipment is not used, unless encountered for an extended period of time (over 1 hour).
LIGHT	The rate of accumulation may create a problem if flight is prolonged in this environment (over 1 hour). Occasional use of de-icing/anti-icing equipment removes/prevents accumulation. It does not present a problem if the de-icing/anti-icing equipment is used.
MODERATE	The rate of accumulation is such that even short encounters become potentially hazardous and use of de-icing/anti-icing equipment or diversion is necessary.
SEVERE	The rate of accumulation is such that de-icing/anti-icing equipment fails to reduce or control the hazard. Immediate diversion is necessary.

Table 1

TURBULENCE REPORTING CRITERIA TABLE

INTENSITY	AIRCRAFT REACTION	REACTION INSIDE AIRCRAFT
LIGHT	Turbulence that momentarily causes slight, erratic changes in altitude and/or attitude (pitch, roll, yaw). Report as Light Turbulence;* or Turbulence that causes slight, rapid, and somewhat rhythmic bumpiness without appreciable changes in altitude or attitude. Report as Light Chop.	Occupants may feel a slight strain against seatbelts or shoulder straps. Unsecured objects may be displaced slightly. Food service may be conducted and little or no difficulty is encountered in walking.
MODERATE	Turbulence that is similar to Light Turbulence, but of greater intensity. Changes in altitude and/or attitude occur, but the aircraft remains in positive control at all times. It usually causes variations in indicated airspeed. Report as Moderate Turbulence;* or Turbulence that is similar to Light Chop, but of greater intensity. It causes rapid bumps or jolts without appreciable changes in aircraft altitude or attitude. Report as Moderate Chop.	Occupants feel definite strains against seatbelts or shoulder straps. Unsecured objects are dislodged. Food service and walking are difficult.
SEVERE	Turbulence that causes large, abrupt changes in altitude and/or attitude. It usually causes large variations in indicated airspeed. Aircraft may be momentarily out of control. Report as Severe Turbulence.*	Occupants are forced violently against seatbelts or shoulder straps. Unsecured objects are tossed about. Food service and walking are impossible.
EXTREME	Turbulence in which the aircraft is violently tossed about and is practically impossible to control. It may cause structural damage. Report as Extreme Turbulence.*	

* High level turbulence (normally above 15,000 feet MSL) not associated with cumuliform cloudiness, including thunderstorms, should be reported as CAT (clear air turbulence) preceded by the appropriate intensity, or light or moderate chop.

NOTE	REPORTING TERM	DEFINITION
1.	OCCASIONAL	Less than 1/3 of the time
2.	INTERMITTENT	1/3 to 2/3 of the time
3.	CONTINUOUS	More than 2/3 of the time

Table 2

The C-130 Fin Stall Phenomenon

THE *Gooney Bird* of the future . . . that's what many people call the durable C-130 *Hercules.* It has been around the Navy and Air Force for almost 20 years and will be around a lot longer. By any measure, it is a classic airplane. It has been used as both an inter and intra theater airlifter, a bomber, a refueler, a ground attacker, a command post, a rescuer, an ambulance, and probably half a dozen other roles. About the only role it hasn't played is that of an air-to-air intercepter (and we're not too sure about that).

It's a good airplane, and like the *Gooney Bird,* a forgiving airplane. Neither, however, is without its idiosyncrasies; and one common to both is the phenomenon known as *fin stall.*

What Is It?

You who push 130s around are probably familiar with terms such as "rudder lock" or "rudder force reversal," both of which carry ominous overtones, and both actually concern the phenomenon of fin stall.

To explain fin stall, let's drop back and review a basic concept of directional stability. Let's remember that left yaw produces right sideslip, with the relative wind coming from the sideslip side. Okay here we go . . .

Sideslip produces forces on the airplane forward of

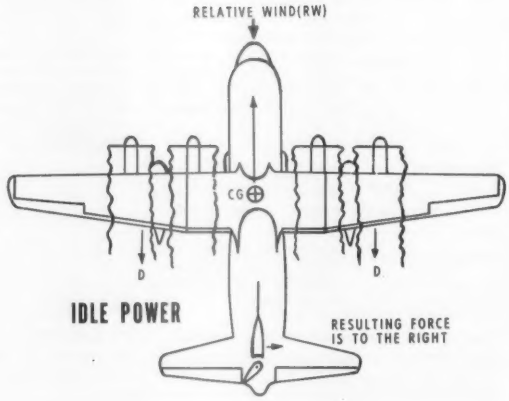


Fig. 1

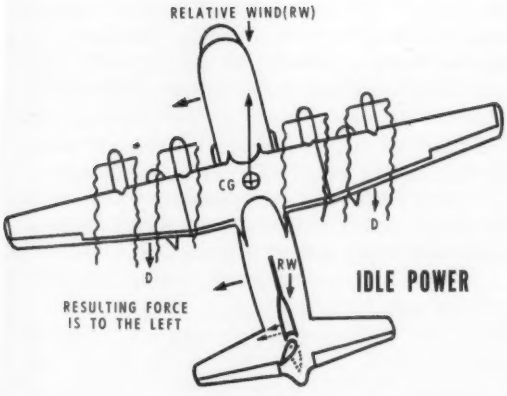


Fig. 2

the CG (center of gravity) which tend to increase the yaw angle. In order for an airplane to possess the desired tendency to return to a zero sideslip angle or not increase the sideslip angle, the forces aft of the CG must be in a direction to return the airplane to straight flight or prevent the sideslip angle from increasing.

As seen in Fig. 1, an initial application of left rudder will cause a resulting force to the right which, in turn, will cause the airplane to start yawing to the left. If the force vector remains to the right, the desired stability is not achieved; and the sideslip angle may increase. However, as the airplane continues to yaw to the left and the sideslip angle stabilizes (Fig. 2), the forces on the vertical fin are to the left (left rudder applied). These forces will keep the sideslip angle from increasing and will thus provide the necessary stability.

Whoops! How did we abruptly switch force vectors?

When the rudder is neutral, the airfoil formed by the vertical fin and rudder is symmetrical. If the relative wind is down the centerline of the airfoil, there will be no unbalanced lift. If, however, the rudder is deflected, it causes the airfoil to become asymmetrical. A new line down which the relative wind must flow is formed and called the camber symmetry line. On initial

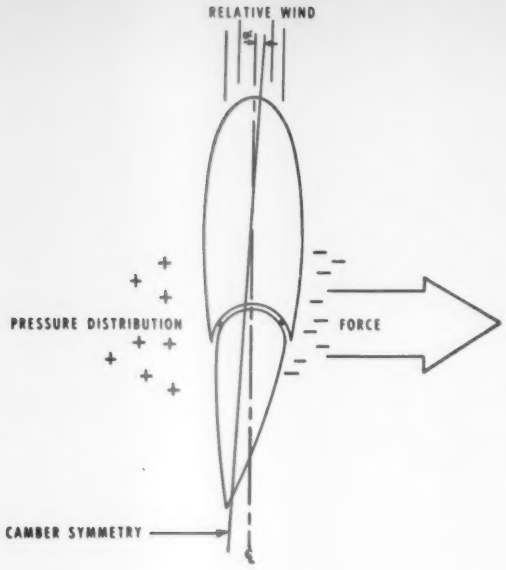


Fig. 3

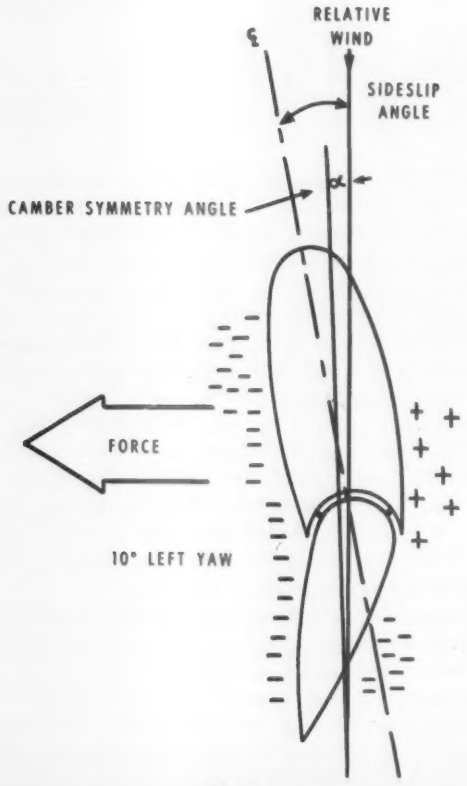


Fig. 4

application of rudder, the relative wind flowing over the newly formed airfoil produces negative pressure on the "long side" and positive pressure on the "short side" of the airfoil, resulting in a force vector: right force for left rudder and vice versa (Fig. 3).

The airplane will continue to yaw to the left (left rudder applied) until the sideslip angle is greater than the camber symmetry angle. When this occurs, the resultant pressure distributions and force vectors will have swapped sides (Fig. 4). If the rudder is released, the forces will cause it to float back toward neutral, increasing the restoring force and causing the airplane to yaw toward zero sideslip. This is the desired stability feature.

In some airplanes (C-130, C-47), a sufficient sideslip angle can be induced to cause airflow separation. When the rudder is deflected and a sideslip is produced, the relative wind is acting on an upside-down airfoil, which, basically, is not very efficient. At certain sideslip angles, the interaction of fuselage interference, vortex from the wing to fuselage juncture, and engine slip stream, combined with the magnitude of the angle-of-attack can cause a disturbed airflow, separation, and fin stall. This air flow separation can produce forces that will cause the rudder to float to a larger angle (Fig. 5). When the rudder begins to float, a force reversal occurs; that is, a right pedal force is required to keep the rudder from floating to a larger left angle. The stabilizing force is diminished, and the airplane yaws further left producing a greater right sideslip. The rudder is "locked" aerodynamically and will not return to a lesser sideslip angle of its own accord.

Fin Stall C-130 Style

As shown, fin stall is a product of large sideslip angles. In the C-130 (as well as other airplanes) there are basically two ways to perform sideslips. The first is the wings-level skidding turn used by some pilots to make small heading corrections during instrument approaches, formation maneuvering, and very low (altitude), level turns. These turns are accomplished by feeding in rudder while keeping the wings level. During the wings-level heading-change maneuver, it is impossible to produce fin stall with a slow deliberate application of full rudder at speeds of 1.2 times power-off stall or greater.

Sideslips are also induced during crosswind approaches and landings where no heading change is desired. Pilots are familiar with the wing-low method for crosswind landings in the C-130 (the only method that can be used). The wing is lowered into the wind, and opposite rudder is applied to maintain a straight flight path. Greater sideslip angles can be produced by the wing-down method; therefore, this is more likely to produce fin stall. But sideslip angles required for all

normal operations are not of the magnitude that will produce fin stall.

After the fin has stalled on the C-130, and if the rudder is allowed to float, the airplane will yaw out to about a 40 to 45 degree sideslip angle. It stabilizes at this point due to the barn door effect of the vertical fin. Under these conditions, the rudder will maintain about a 24-degree deflection. If the rudder is forced back to neutral, which requires a maximum of 50 to 100 pounds of rudder pedal force, the airplane will return to zero sideslip.

Fin stall in the C-130 has never been experienced in the power-off configuration or during slow deliberate application of right rudder. This implies that the airplane is less stable with power on and that left rudder is more powerful than right rudder. Both are true; and to explain a bit, we have to talk about torque effect.

The major contributor to torque effect in a multiengine propeller-driven airplane is the spanwise lift distribution on the wing. Figure 6 portrays the power-on, spanwise lift distribution on the wing of a C-130. Flow from the props produces more lift on the wing on the upcoming blade side of the propeller wash. This produces a peak lift on the left side of the propeller slipstream, sloping to a lower lift value on the right side, and shifts the total lift on each wing to the left. To keep the airplane from rolling, aileron is applied; and one would think that this would make the lift symmetrical again. However, because the ailerons are located far out on the wing, they balance the rolling moments; but the peak lift areas remain to the left of each wing.

Lift on the wing also produces induced drag with spanwise distribution very similar to the left distribution. Consequently, the total drag on the left wing is further outboard than on the right wing, causing the airplane to turn to the left. The pilot must apply right rudder to prevent this turn to the left. In straight flight, right rudder trim is required; therefore, more rudder is available for left yaw, right sideslip than there is for right yaw, left sideslip. For this reason it is possible to stall the fin because of left rudder application, but it is not possible to do so by applying right rudder.

It's important to emphasize at this point that fin stall will not occur due to turbulence, crosswind corrections, or engine-out control maneuvers.

Required Conditions To Produce Fin Stall

- Power on (usually power for level flight or greater)
- Left rudder (left yaw; right sideslip)
- Wing down to maintain straight flight path (zero turn rate)
- Speed from minimum to 170 KIAS
- Flap and gear either up or down

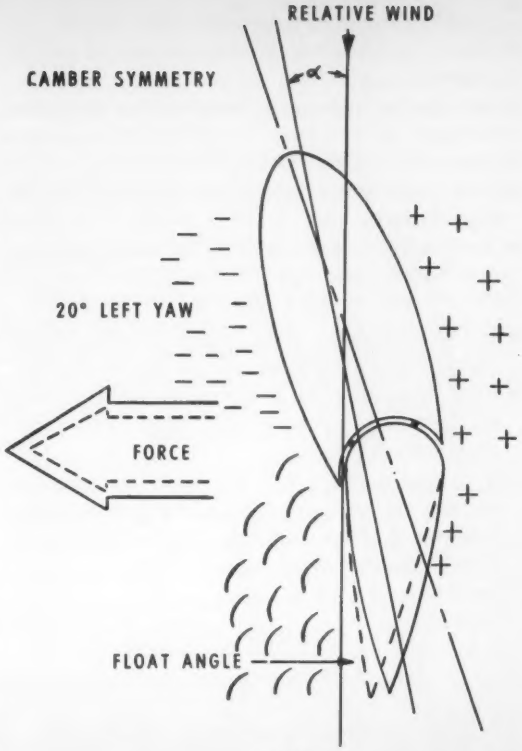


Fig. 5

LIFT (OR DRAG) SPANWISE DISTRIBUTION

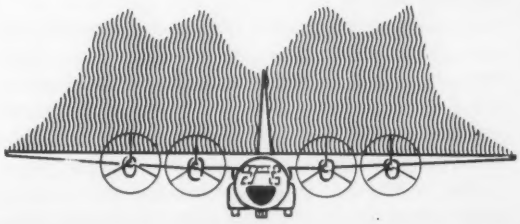


Fig. 6

Flight Characteristics Associated With Fin Stall

- Onset of unmistakable fin buffet between 15 and 24 degrees sideslip
- Reduction in rudder pedal forces at 18 to 30 degrees sideslip
- Noseup pitching tendency
- Zero rudder pedal force at some point above 20 degrees sideslip
- An increased turning rate to the left which cannot be controlled by bank angle

Pilot Actions

- Normal maneuvering of the airplane, including normal skidding turns and sideslips, will not result in fin stall.
- Avoid large sustained, abrupt rudder inputs at slow speed, especially power on, unless needed for engine-out control.
- If fin stall occurs, return the rudder to neutral by applying opposite rudder (50 to 100 pounds rudder pedal force) plus a combination of the following, if flight conditions permit:

  Level wings

  Nose down

  Reduce power

  Use asymmetric power
- If an undesired rudder control input is experienced, such as a hardover, which results in fin stall, turn the rudder boost pressure off and control the airplane with asymmetric power. If feasible, use also the other recovery techniques mentioned previously.
- Never attempt to force the airplane into a fin stall.
- Do not perform power-on stalls. If a power-on stall is entered inadvertently, do not attempt to maintain lateral control by large rudder inputs.

Summary

Fin stall is a phenomenon that all C-130 pilots should be aware of and know how to counteract, should it occur. It is a maneuver that the pilot has to almost force the airplane into, but the possibility still remains that the pilot may inadvertently encounter the phenomenon. One point must be emphasized again. Never attempt to force the airplane into a fin stall for any reason.

Adapted from a briefing given by Walter E. Hensleigh, Chief Engineering Test Pilot, Lockheed-Georgia Company, and reprinted with permission of *TAC ATTACK*. ◄

Water in the Fuel

ALL aircraft, when properly preflighted, undergo a fuel-sample check. Most fuel samples are just that – fuel. However, there are enough instances when sediment and water are found to warrant continuation of this important practice.

When a fuel sample is not taken, either forgotten or a preflight lackadaisically performed, you can bet that's the bird that will have trouble. For example, one brand new LAMPS aircraft was about 10 miles out over the ocean when the pilot noted the fuel bypass light illuminate.

The HAC headed for Homebase and made a precautionary approach and an uneventful landing. Fuel samples were taken. A large quantity of water was found in the sump tank and the left auxiliary tank.

Both auxiliary tanks had been flushed with water and stored in the hangar for several days before being installed on the aircraft. Fuel samples prior to this and the preceding flight had been taken. Water was not discovered prior to either of the two flights because *fuel samples were taken only from the starboard sump drain.*

It was not enough that the tanks were improperly purged of water, but the felony was compounded by improper preflight. There are 10 low point drains on this bird – the majority of which were not sampled. These two booboos could only have occurred when established maintenance procedures were not followed. OK, guys, everyone out of the pool; back to the classroom! ◄

Corsair Affair

A SECTION of A-7Es launched from a CVA on a night combat mission. The night was very dark, with no moon or visible horizon.

Launch, enroute, weapons delivery, and egress phases of the flight were normal in all respects. The lead aircraft experienced TACAN failure inbound to the ship. At 30 miles, section lead was passed to the wingman. He was to lead the flight to marshal, through a section penetration, and drop the leader off at 3/4-mile on the ball. The evolution was conducted with no apparent difficulty and the flight leader made an uneventful arrested landing.

The wingman entered the bolter pattern. He called the ball and was given a fouled deck waveoff due to problems with one of the cross-deck pendants. He again entered the bolter pattern and called abeam with 1700 lbs of fuel. At this point, the KA-6D tanker (already airborne) was instructed by the tanker controller to "hawk" the pattern for the A-7E, which received a second fouled deck waveoff due to an aircraft with hook difficulties hung in the arresting gear.

The tanker was at the *Corsair's* 2 o'clock position paralleling the base recovery course. The KA-6D was on departure control frequency and the A-7E was on CCA final control frequency.

The A-7 proceeded straight ahead and leveled at 600 to 800 feet. The tanker then commenced a port nose-down turn into the A-7, crossing his flight path at an apparent 90-degree angle, in a high angle-of-bank, in what appeared to be a vertigo-induced unusual attitude. This occurred about 2½ miles ahead of the ship.

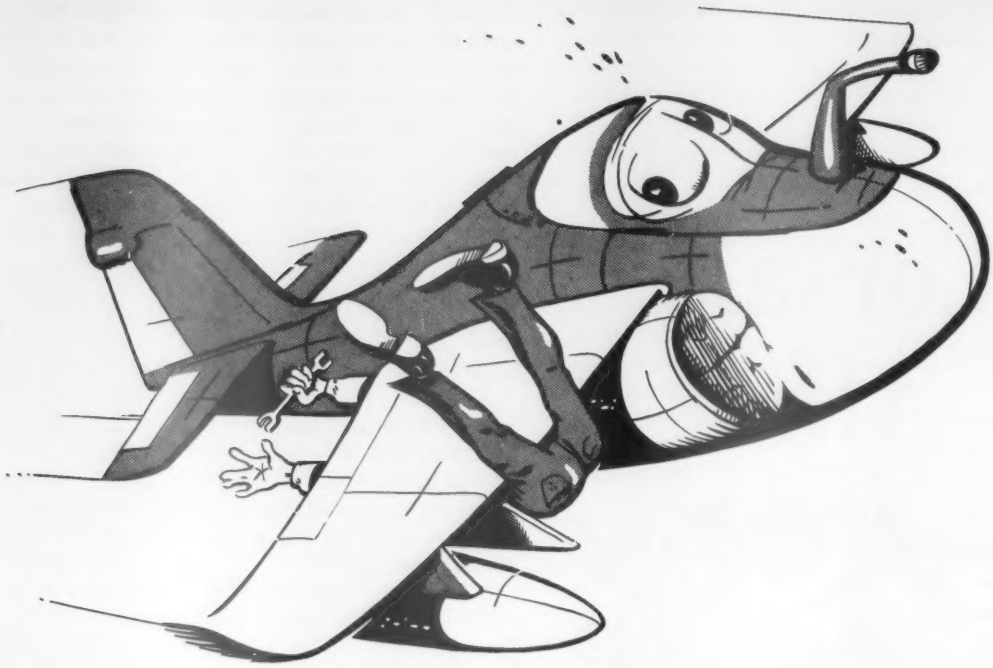
As the tanker crossed his flight path, the A-7 pilot pulled up abruptly and turned to port. He climbed about 100 to 150 feet, dropped his nose to about 30 degrees below the horizon, and *flew into the water.* The tanker pilot effected a recovery, pulling out at 300 to 500 feet.

The exact cause of this accident remains undetermined, but the investigators concluded pilot factors were the most probable causes, i.e.:

- The A-7E pilot failed to properly monitor aircraft altitude and airspeed due to preoccupation with rendezvous on the tanker.
- The tanker pilot failed to maintain heading and altitude during the rendezvous.

Subsequent to this accident, a CVA/CVS NATOPS review conference was held at NAS Norfolk (in April 1972). Inflight refueling procedures, including proposed revisions submitted by the air wing involved in this accident, were extensively reviewed. Revisions to the CVA/CVS NATOPS manual formulated at the conference have since been approved by CNO and will be promulgated in a forthcoming revised edition of the manual. Included are definitive inflight refueling procedures which will reduce the probability of pilot disorientation.

Anymouse



Last Minute Maintenance

The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. These reports need not be signed. Self-mailing forms for writing Anymouse Reports are available in readyrooms and line shacks. All reports are considered for appropriate action.

REPORT AN INCIDENT,
PREVENT AN ACCIDENT

AN A-6A was scheduled for a 1230 launch, but was delayed due to last minute maintenance by the airframes shop. When the flight crew went to the aircraft and found maintenance in progress, they returned to the hangar to await notification that the aircraft was ready.

When manning the aircraft for the second time, the pilot noted that work was still going on as he preflighted the aircraft. A maintenance man was installing access panels just aft of the slat between the starboard, forward landing gear door and the No. 4 pylon. After manning, the pilot gave the plane captain a signal that he was ready to start engines. The plane captain then signaled the man operating the huffer unit to apply starting air.

The huffer operator was on the same side of the aircraft as the man working on the slat, and could plainly see him. With the maintenance man positioned between the pylon and the landing gear door, the engines were started.

As hydraulic pressure built up, the landing gear door popped to the full open position, almost pinning the man between the door and the bomb rack attached to the No. 4 pylon. Fortunately, the man fell backwards avoiding serious injury.

Haste in completing maintenance and in launching the aircraft were major factors in this incident. The aircraft should not have been released for flight or manned by the crew with maintenance still in progress. The plane captain should not have given the start signal unless he was

positive the aircraft was clear of personnel. The huffer operator should not have applied starting air with maintenance still being performed on the aircraft. The combination of poor judgment by all concerned could very easily have resulted in a serious injury.

Maintenancemouse

Right on . . . almost. There are times when operations require last minute maintenance while crews are manning aircraft. However, last minute maintenance is recognized as a high risk procedure and should be undertaken with caution. Obviously, no aircraft should be started when someone is working where he can be injured.

Walking Pneumonia

I WAS scheduled as aircraft commander for a local day fam at NAS West Coast. My copilot was an experienced helo pilot, but was in the process of transitioning to another type helicopter. I am relatively experienced in the aircraft and can hold my own in most readyroom discussions.

I had flown similar flights several times before and didn't expect any particular problems. During the brief, my copilot mentioned that I seemed to have developed a cold. I acknowledged that I did have some slight congestion, but felt fine. In fact, I had developed a head cold 3 weeks earlier. Due to the tempo of operations, I had avoided our hawk-eyed flight surgeon and had experienced only a few bad days. Being a WestPac warrior, I was prepared to endure some discomfort.

Following the brief, we proceeded to the hangar and then to the flight line. The preflight was extremely thorough. The flight was enjoyable, and everything went smoothly.

After landing, debriefing, and signing the yellow sheets, we commenced a brisk end-of-the-day walk back to our office. Shortly after leaving the hangar, I began to wheeze and became short of breath. Halfway between the hangar and office, this intrepid WestPac warrior was doubled over, gasping for air. My fingers were turning blue.

The look on my copilot's face was one of confusion. He didn't know whether I had dropped my pesos or if this was somehow related to his flying ability. I managed to stagger to sickbay. A couple of hours later, after X-rays and a close examination, the flight surgeon advised that my "slight head cold" looked suspiciously like pneumonia.

Because of a can-do, I-can-hack-it attitude, I had jeopardized the lives of my crew. Sure, I can try to justify the incident by saying it didn't happen in the air, but who knows what would have happened if I had lost control of my body when I needed to be at my best? My copilot was experienced, but his experience in this type aircraft was limited; and there is no guarantee that he would have been able to handle all emergencies.

I have always been careful and diligent about inspecting aircraft and wouldn't think of ignoring danger signs from aircraft instruments. But, foolishly, I neglected the many warning signs from my body telling me I was not up to par.

A grounded-but-wiser-mouse

All's well that ends well. Hope your testimonial will serve to alert others to the hazards of flying (which often turn out to be very demanding) when sick or overly fatigued.

Courtesy *Lockheed Airborne ASW LOG*

A TOUGH B

THIS is a story of tough airplanes and resolute men. It is also a story of small, and not-so-small, miracles strung end-to-end.

It started over the open sea near Midway during a heavy rain. Momentarily, the air was filled with the noise of wrestling giants; and a few seconds later, fragments of their metal bodies fell to the water and disappeared. Then two wounded birds, a VP-4 *Orion* and a Coast Guard *Hercules* climbed apart, fled back to Midway, and landed safely. The flightcrews were sweaty but unscratched.

Already we have at least a couple of respectable-sized miracles.

The midair occurred during a search for a sinking merchantman 200 miles at sea. The two airplanes had been conducting creeping-line searches at about 500 feet in adjacent areas. Radar was unmanned in both airplanes. As the P-3 made a climbing turn, its crew spotted the C-130 slightly above them and off the port wing – too late. The P-3 wing and stabilizer slashed into the belly of the C-130.

The C-130 was ripped open almost the length of its cabin, but gear and all controls still functioned. The P-3 lost more than 8 feet of its port wing, and its vertical stabilizer was damaged; but it was controllable.

A large sheet metal Band-Aid was applied to the underside of the C-130, and it soon flew back to the mainland. The devastation in its lower fuselage can be guessed from the $500,000 estimate for repair.

But no quick patch-job could restore the broken wing of the *Orion* to trans-Pacific airworthiness. After considerable discussion and preparation, a 10-man field team from the Alameda Naval Air Rework Facility flew to Midway, armed with assorted tools and parts, including a special aileron. The aileron was only a bit more than half the normal length, but the tab was full size.

Working 13 consecutive 12-hour days, the team

BIRD LIMPS HOME

Above: A young inhabitant of Midway "awaits" his wings.

Left: The ragged end of the wing is blanked off by NARF workers.

Below: Standing under the wing of the crippled P-3B they flew 3800 miles are the crew. From left: ADJC K. D. Frontz, flight engineer; LCDR Norm Ray, pilot; AE1 W. D. Powell, flight engineer; LT R. C. Asbell, navigator; and LCDR M. H. Manahan, copilot.

removed the tangled debris from the end of the crippled wing, made numerous riser repairs and three spar repairs, replaced some top skin, and capped off the wingtip. The outboard fuel cell had been torn open by the collision (though it still contained some fuel on landing), but the NARF team patched and sealed the tank so it could be used.

The tank tested OK, and the airplane was pronounced airworthy. More miracles had thus transpired, and now it was time for the fun part of the saga.

A highly qualified P-3 pilot, LCDR Norm Ray, and a handpicked minimum crew flew to Midway from NAS Pax River.

They conferred at some length with the men who had been living with the crippled bird:

We have faith in it, but still we think you have to be conservative. Its flight characteristics are bound to be pretty bad. We figure stall speed will be about 140 KIAS and you probably should stay below 210 knots . . . No, we just don't have a way here to figure what to do about trim at takeoff. You'll just have to see how it goes . . . That wingtip may be funny-looking, but it's strong as hell. You could leave it that way for the life of the airframe if you could put up with the screwball flying characteristics . . . You want to hear something funny? We have been over every square inch of that airplane and there is not one hint of damage except for that wing and the stabilizer. No rivets popped, no skin cracks, no fuel

leaks, no nothing . . .

And so on, for hours.

Two nights before the long flight across the sea, the engines were started. This was something of an event in itself. The airplane had been preserved for the nearly 4 months that had elapsed since the accident. But they started with hardly more fuss than if they had flown a training mission the day before.

Came the morning of April 17 – departure time. Again the engines started as brisk and businesslike as ever. The clipped-wing *Orion* quickly accelerated down the runway to 100 knots, at which time a smoke removal door popped. Abort. Inspection. No mechanical failure. Try again. This time, no problem.

Since there was no recommended trim adjustment, LCDR Ray guessed half-normal might be right. At 100 knots, he realized he had made too great a deviation from normal – he hadn't adequately allowed for the effect of the full-sized tab. So he adjusted trim, and the airplane "flew off quite comfortably."

Throughout the trip, the fuel load was kept unbalanced – 2000 lbs more in the right wing than the left to compensate for the reduced lift on the left side. Even so, the airplane exhibited some unique flying qualities.

There was increased power divergence and stronger dihedral effects to the left. Dutch roll was worse than normal and more lightly damped. The yoke had to be held more aft than normal during cruise and rotated about 35 degrees to the right. However, with the unbalanced fuel load, the airplane did trim out approximately as it would with all its wing area.

The highest altitude flown was 27,000 feet. At that level, the airplane handled about the way a P-3 usually does at 36,000 or an A-4 with drop tanks at 35,000.

Shortly after takeoff, the pilot glanced out the side window and discovered that the shortened wing could not be seen beyond the outboard engine. It was as if it ended at the nacelle. This was an unsettling experience, and LCDR Ray never did get used to it. It still startled him the last time he glanced out to port near the end of the trip.

There were two elements of uncertainty from the beginning – fuel leaks and weather.

The tanks checked out OK on the ground, but the possibility remained that after the wings had flexed a few times in flight, seams would open up in massive leaks. So the crippled bird put down at Barber's Point for a thorough check. There were no leaks, so there was more peace of mind on the second leg of the trip.

But the weather couldn't be settled at the halfway point. It had been agreed that the flight should be restricted to visual conditions and all turbulence had to be avoided. However, weather all over mid-Pacific was skitterish – in some places downright grim.

SAR forces had been alerted ahead of time and were spotted at intervals along the route to the mainland. At Midway, two crashboats waited conveniently off the end of the runway at takeoff time, and a crashbarge lay at anchor on the reef beyond. A chase plane took off just before the flight and quickly explored the air space from the deck to 30,000 feet for turbulence.

Then the clipped-wing *Orion* took off, climbed into heavy overcast at about 1500 feet, broke out at 3500, and saw only high altitude clouds, and almost no turbulence, the balance of the trip.

As the airplane approached the Golden Gate, contact was established between the plane and the controller at Alameda. The controller knew that this incoming plane had some sort of emergency, so he asked, "What is the nature of your emergency?"

"I'm missing 8 feet of wing."

There was a 30-second pause, then the normal crisp, military response: "Right, sir – missing 8 feet of wing."

It pays to keep your cool in a control tower, even when you hear an obvious put-on. ◄

...Hard to Stop

AFTER an early breakfast, consisting of only one glass of orange juice, an A-4C pilot briefed for a two-plane cross-country flight. The flight was to be filed IFR, and he was to fly wing.

About 25 minutes after takeoff, the flight was clear of clouds and level at FL 290 when the pilot experienced a loud, high-frequency tone in his earphones. He turned down the radar altimeter and radar obstruction wa ning volumes, but the tone persisted. He then turned down the UHF volume, and the tone ceased.

The AJB-3 and RMI were noted to be inoperative. He communicated his difficulties to the flight leader using a HEFOE signal. The flight leader elected to return to Homebase and descended to FL 220 where the wingman deployed his emergency generator. The UHF volume was then successfully turned up without the high frequency tone, enabling the wingman to communicate by radio with the flight leader. The AJB-3 and RMI were still inoperative.

During descent to Homebase, the flight entered an overcast layer at 9000 feet but was VFR between layers at 7000. After reentering clouds, while continuing descent, the wingman experienced vertigo.

The flight was in and out of the clouds at 1500 feet prior to glide slope interception. Airspeed on GCA final was 140 knots with speed brakes in. The leader called the runway in sight at 5 miles and was cleared to land on Runway 1R (12,000 feet long). He passed the lead to the wingman and went around.

Just before the wingman touched down, he observed a very low ball and added power, but overcorrected. He landed fast 700-800 feet past the mirror (located 750 feet from the end of the runway). He commenced aerodynamic braking then lowered the nose with 6500 feet remaining.

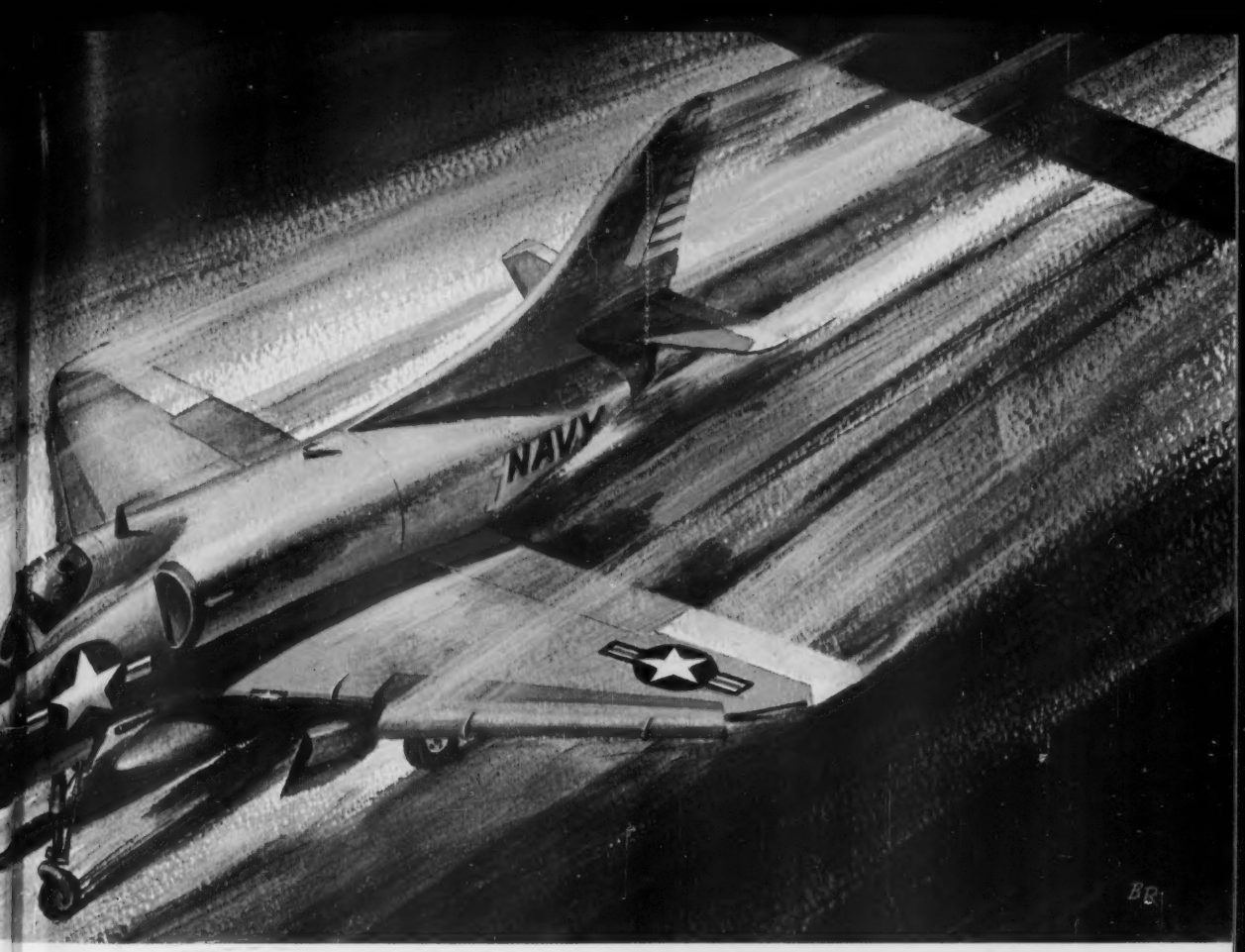
At 6000 feet, the flaps were raised and braking was commenced (AFC 272 not incorporated). He applied light braking until airspeed was below 100 knots, then moderate braking. With 4000 feet remaining at 95 knots, the pilot still thought he had control of the aircraft and would be able to stop on the runway.

Approaching the abort gear (1500 feet from the end of the runway), the pilot noted less than 80 knots and still thought he could stop the aircraft. Braking was discontinued as the aircraft crossed the abort gear, then reapplied. The pilot then suddenly realized he wouldn't be able to stop on the runway. He shut down the engine and stood on the brakes, but to no avail. The aircraft continued off the end of the runway, past the overrun, and stopped 1385 feet off the runway's end. There was no aircraft damage.

Investigation revealed that the starboard interior console lighting rheostat and wiring had burned out causing the AJB-3 and RMI to fail.

The CO, in his endorsement, stated:

"After this incident, functional checks of the aircraft involved did not reveal any brake system malfunction. The aircraft was test flown and landed without difficulty. As a result, it can only be concluded that the pilot did not use correct landing and stopping



techniques.

"It is likely that anxiety, complacency, and a lack of knowledge all played a part in this incident during which the A-4 rolled approximately 11,800 feet before stopping. That such an event could occur, even though the squadron held a 2-day comprehensive safety standdown only 2 months earlier, is notable. Also, frequent NATOPS lectures and safety examinations have been conducted; and all pilots have been closely observed during familiarization flights.

"It has been emphasized many times within this squadron that all pilots should set up their approaches to land on speed, on the end of the runway. This was not accomplished in this case. No waveoff was attempted, even though there was more than adequate fuel available for a go-around; and the field was VFR. Aerodynamic braking is not mentioned in NATOPS for any condition, and neither is raising the flaps unless there is a strong crosswind. At the time of landing, there was a 20-degree crosswind at 8 knots.

"In addition to these procedural errors, the pilot did not allow the nosewheel to fall through normally and consequently did not hold full forward stick after landing. He failed to correctly correlate aircraft speed and runway distance remaining and did not use available runway abort gear. The fact that the pilot did not eat a proper breakfast before the flight is a possible contributing factor in the form of hypoglycemia.

"This incident was thoroughly discussed a short time after it happened at an All Pilots Meeting. NATOPS procedures for all types of landings and proper braking techniques were extensively reviewed. Adherence to these procedures was strongly reemphasized.

"Constant vigilance regarding creeping complacency and the adequacy of a squadron's training program is necessary. A part of the program must be devoted to keeping pilots aware of the inherent dangers involving a lack of knowledge of normal and emergency NATOPS procedures, as well as the dangers of nonadherence to these procedures."

A helicopter pilot filed a VFR flight plan and departed under marginal weather conditions. Fifteen miles from the field, the pilot flew in and out of clouds at 500 feet AGL, experienced vertigo, and began a descent. Still in the clouds at 200 feet, he descended further and flew into the trees.

Causal factors: *Pilot* – improper navigation and weather planning, penetrated weather conditions beyond his capability, entered IFR conditions on a VFR flight plan in an aircraft restricted to VFR flight. *Other personnel* – supervisory. (Failed to ground pilot with a known health problem and failed to ensure qualification of pilot before issuing an instrument card.)

This was just one accident which occurred last fiscal year. Let's take a look at some of the others.

FY-72 Helicopter Review

PRELIMINARY statistics for FY-72 released by COMNAVSAFECEN revealed a new low in the All Navy/Marine major accident rate – .89 per 10,000 hours. However, the helicopter community did not improve its safety record. The helicopter major accident rate was 1.10 – *the same as FY-71.*

Helicopter pilots, crewmen, and support personnel may be interested in a broad picture of the past fiscal year compared to FY-70 and 71. Figure 1 depicts some of the statistics. Note that there were five fewer helo accidents in FY-72 than in FY-71, but the estimated flight hours for FY-72 were considerably less. Hence, the accident rate for the past 2 years is the same. Note also that of the various helicopter series, each one, with H-2s excepted, shows a lower rate in FY-72 than in FY-70. However, neither the H-34 nor the H-46 community did as well this past fiscal year as they did in FY-71.

Historically, the ratio of helicopter fatalities to total major accidents has been less than fixed-wing. However, for FY-72, the ratio was quite close. Helo fatalities per accident were .54, and fixed-wing fatalities per accident were .60.

A majority of FY-72 mishap reports were reviewed to see what, if anything, was new and different in causal factors. If one may generalize – there's nothing new. The same human errors are being committed over and over again by pilots, aircrewmen, and support troops.

It is not entirely possible to be objective in the assignment of causal factors, but there is enough consistency to categorize the various kinds of human

Major Accident Rates

Model	Rate *FY-72	Rate FY-71	Rate FY-70	Number FY-72	Number FY-71	Number FY-70	Aircraft Damaged ** FY-72 Only: Destroyed	Aircraft Damaged ** FY-72 Only: Substantial	Injuries FY-72 Only: Fatal	Injuries FY-72 Only: Major	Injuries FY-72 Only: Minor
All Navy/Marine	.89	1.13	1.37	238	324	439	177	67	143	57	52
All Helicopters	1.10	1.10	1.81	46	51	90	34	12	25	25	27
H-1	1.56	1.80	2.49	19	23	31	15	4	4	14	9
H-2	1.76	.36	.16	4	1	5	4	0	2	0	2
H-3	.80	1.44	1.28	7	10	10	5	2	3	2	9
H-34	1.37	0	2.10	3	0	15	3	0	2	0	0
H-46	.96	.68	1.50	9	9	21	5	4	14	2	2
H-53	.86	1.60	1.24	4	7	5	2	2	0	7	5
H-57	0	.50	2.35	0	1	3	0	0	0	0	0

* Rates based on estimated hours for May & June 1972.

** Includes all aircraft damaged in the mishap, therefore totals will exceed total accidents in some models.

Fig. 1

errors which occurred last year. These factors are shown in Fig. 2.

Notice that pilot errors have been divided into two categories. One-third of pilot causal factors have been placed in the "no-no" category. These are the kinds that

Pilots

Controllable

Poor cockpit coordination	4
Fatigue	3
Weight & Balance	2
Improper fuel management	2
Inadequate preflight	2
Preoccupation	2
Failed to use checklist	2
Violated SOP/NATOPS	2
Unauthorized maneuver	1
Improper brief	1
TOTAL	21

Judgment or Technique

HAC/IP failed to take control	6
Improper takeoff/landing technique	6
Improper use of controls	6
Improper autorotation technique	5
Exceeded ability	4
Lost RPM	3
Misjudged landing area	3
Improper navigation	3
Improper demonstration	2
IFR on a VFR flight plan	2
Improper flight supervision	2
Failed to avoid obstruction	2
Improper weather planning	1
Hard landing	1
TOTAL	46

Other Personnel

Training	8
Pilot Qualifications	8
Plane captain (preflight)	2
Crew chief (gear check)	3
Medical	1
Design	1
Inspection requirements	1
Undefined max gross load	1
Misassigned mission	1
LSE signals	1
Pri-Fly control	1

Environment

Crowded flight deck	1
Weather	1
Sea State	1

Fig. 2

nevva shudda hoppen. These factors are completely controllable by pilots. The other pilot error category involves goofs in judgment or technique. It is necessary to explain that in nearly every major accident there are multiple causal factors. Readers are cautioned *not* to try to relate any one factor as the single cause of an accident.

Other personnel causal factors which stand out are supervisory errors. These errors involve ground and flight training deficiencies and improper pilot qualifications. Several accidents occurred where a pilot was scheduled without the proper qualifications for the flight.

Environmental causal factors did not play as big a part in FY-72 major accidents as one would suppose. However, there were three accidents attributed to this factor.

Those accidents which resulted from material failure are not addressed in this article. This is intentional. Let's focus attention on and consider those avoidable causal factors which, if eliminated, will afford a better chance of fewer accidents for FY-73.

Supervisory Coordination

The introductory accident is representative of the flight operation that needs no repeating. Wouldn't you agree that it was a senseless accident? The pilot was in flight status when he shouldn't have been; his operations, training, and schedules supervisors ignored not only this fact, but also issued him an instrument card without a check. Finally, the pilot chose to ignore his physical limitations and his limited pilot capabilities and launched under marginal weather conditions.

Those factors which were controllable and which could have enhanced flight safety required coordination between Ops, Training, and Schedules. It was encumbent upon all three to ensure that flight and ground syllabus training were properly conducted; that standardization, NATOPS, and instrument checks were flown when due; and that physical exam chits weren't lost somewhere in the system – or ignored.

Pilot Technique

A HAC decided to make a practice autorotation. All phases were normal until, for some strange reason, he initiated a hairy flare at 200 feet AGL and held it too long. Abruptly, he lowered the nose and entered an almost vertical descent with a high sink rate. He continued to a hard landing, lowered the collective, and moved the cyclic aft. The main rotor blades struck the tail pylon.

Causal factors: *Pilot* – poor technique, failed to recognize excessive flare at too high an altitude, lost RPM in the maneuver, misused collective and cyclic controls after landing.

There were *9* accidents in FY-72 as a result of poor pilot technique during precision approach/autorotation maneuvers. In the majority of reports, reference was made, time and again, to excessive airspeed, excessive sink rate, loss of RPM, hairy flares, and misuse of collective and cyclic controls.

It is difficult to discuss autorotations without becoming emotional. There are those who believe full autos to be the answer to most problems in the helicopter community. Then, there are those who won't even mention full autos. It makes no difference which side you take – let NATOPS be your guide. But remember, an autorotation is:

- A *precision* maneuver and should be shot *precisely.*
- The only inflight maneuver which may *save one's neck* in the event of fuel or engine problems.
- Not hard to perform – with *practice.*

Perhaps not enough emphasis is placed on autorotations by most squadrons nor by air stations with SAR responsibilities.

Instructor Technique

Making an approach to a ship, a copilot experienced difficulty in controlling the helo's yaw over the deck. After he steadied the aircraft, he began to lower the collective just as the ship started a 10-degree roll. As he touched down, the tailwheel swiveled, the left mainmount rose off the deck, the right mainmount skipped twice, and the helo began to rotate counter-clockwise. The helicopter was damaged but did not overturn.

Causal factors: *Copilot* – exceeded experience level, poor landing technique. *Pilot* – failed to take control in time. *Other personnel* – supervisory. (Copilot was not qualified in model.)

There were *12* accidents during FY-72 in which the pilot/HAC/instructor permitted the copilot/PUI/student to continue a maneuver unsafely, too long, with the maneuver ending in an accident. Ridiculous! Operational commands would do well to introduce more training command know-how into indoctrination/familiarization flights. The basic principles of *What, Why,* and *How,* plus a demonstration, will usually eliminate any doubt from a "student's" mind about what is expected or how it's to be done. Then, for cryin' out loud, you HACs, insist that it be done correctly – from entry to recovery or termination of the maneuver.

Summary

The goal for FY-73 is to reduce the accident rate by eliminating the controllable causal factors. This can be done by conducting thorough preflights and thorough cockpit briefs, good fuel management, good mission planning, use of checklists – every time, and by adhering to SOP and NATOPS procedures.

Additionally, if errors in judgment and technique can be reduced, this year's helicopter safety record will take a quantum jump.

An acronym might help. APART (attitude, power, airspeed, rudder, turns) may keep you from coming unglued.

Happy FY-73.

Experience increases our wisdom but doesn't reduce our fallacies.

Josh Billings

PROFESSIONAL

By Captain Joe Smith, USAF
526 Tac Ftr Squadron

FOOTBALL is with us once again. As I look forward to the season, I can't help but draw a comparison between my profession as a fighter pilot and that of the many professional football players in America today.

There are some significant differences, of course. One is that we don't receive near the publicity and the acclaim for our feats of skill. If a football player fumbles, runs the wrong way, or is tackled behind his own goal line for a safety, he makes the sports pages. The cost – only two points. A pilot who lands 1000 feet short and knocks off a nose gear receives a different kind of publicity – at the cost of quite a few dollars.

What I'm really trying to say is that we play for higher stakes. Aircraft damage and loss of life represent a higher value than a trophy or a $25,000 payoff. But the biggest difference, and the point I'd like to discuss, is that we cannot afford to fumble even once. It is a simple fact of life that no crewmember or aircraft should be lost unnecessarily due to human error.

The unfortunate thing about our profession is that the success or failure of our mission, as it is related to flying safety, is measured solely by how often failure strikes. Nobody keeps statistics on how many lives or aircraft are *saved* by expert airmanship. Daily we hear these phrases describing the performance of aircrews involved in an accident or serious incident – "exercised poor judgment," "displayed little professionalism," "evidenced a lack of proper skill." In fact, we hear references to professionalism, skill, and judgment so much that we tend to lose the meaning the user intended.

The point is, the old phrases are valid – only some of us don't allow them to sink in. Have we become so saturated with all the various gimmicks and flying safety devices that we're missing the serious meaning? It boils down to a failure to communicate, or more accurately, a failure to listen. The person for whom this information is intended is someone like you and me who straps in every day for a living. The problem is that *neither* of us listens to the meaning of all these terms. For example: Do you fly a faster-than-normal final because it's easier than on-speed? Do you accept a given situation, fly there, then call it accuracy? Do you ignore thorough preflight checks because you're in a big hurry? If so, you surely haven't learned from these good phrases, and in our business, you're not a real professional.

The Green Bay Packers didn't win five out of seven NFL championships, three in a row, solely on the basis of having more talent. They had Lombardi, who instilled a professional attitude, a sense of pride, and a team spirit almost unheard of in the field of sports. Lombardi was not only a master of psyche, he was also a brilliant tactician and teacher. In drawing this analogy, it is important to point out some very fundamental

IAL ATTITUDE

n Jo[illegible] Smith, USAF
ac Fi[illegible] Squadron

differences. While we certainly require a professional attitude, a sense of pride, and a team spirit, it is essential that we understand how far we can let these feelings control our actions. A pilot can't let his sense of pride or enthusiasm jeopardize any crewmember's life, his aircraft, or his own life. There is a happy medium. By reaching this happy medium, we are well on our way to being true professionals in our line of work. Our stature is reflected by our *attitude*.

Our professional attitude should probably start with a very deep sense of personal responsibility. Whether you're leading a two-plane, night low-level reconnaissance mission in marginal weather, taking a 16-plane flight on a strike mission, or taking a cross-country to a place you've never been, the feeling you should have is one of personal involvement and responsibility. If you have this sense, you're going to be prepared.

The second facet of a professional attitude is to be positive. Being positive is nothing more than recognizing a situation and responding. A positive attitude is not: "What do I do now?" It's not being reluctant or hesitant. It's knowing what must be done, when, where, and how far to go. A man that's positive will not allow an unfamiliar set of conditions to back him into a corner. He will know the effects of the weather, his fuel state, and his wingman's experience – and his decisions will be based on a combination of these effects. The man who doesn't prepare for all eventualities is cheating, and, as Lombardi said, "Cheat in practice, and you'll cheat when the chips are down."

The third and final facet of this professional attitude is the recognition and awareness that what happened to so-and-so can actually happen to you. The devil's slogan, "It can't happen to me," is our biggest enemy because it denies us the capability to anticipate. Many of us are probably testimony to this pitfall. At one time or another, we may luckily have caught the devil sleeping. But the guy who has done it and hasn't learned from it is the troop *without* the professional attitude.

We pilots and the professional football player have three things in common: a natural ability, a considerable amount of training, and an ever-increasing amount of experience. But our kind of professionalism requires us to have even more, simply because we play for higher stakes. We have to take the attitude, sense of pride, and team spirit instilled in us by our "Lombardis" – our commanders – and apply them to our own actions. We face a potentially different situation every time we are airborne. The success with which we meet these situations is determined by how well we are prepared. This leads to the gist of my message – an individual's actions are governed by his attitude. Develop a *professional attitude*, and in this exacting profession you'll never fumble.

Courtesy USAFE *Airscoop*

One More Time!

AS the old joke goes about the school teacher-staffed house of ill repute, some things are worth doing over and over again until you get it right. Such is the case with learning the proper use of the Martin-Baker ejection seat under normal and abnormal conditions.

Within the past few months, one of our fellow airmen failed his final test – survival after ejection. It wasn't a case of a long enduring struggle against the elements that finally did him in. It was pure and simple lack of knowledge and necessary follow-through after deciding to manually separate from the seat following an ejection above 15,000 feet. It sounds so simple – yet he failed to deploy his chute.

An article first printed in TAC ATTACK, "It Pays to Wait," appeared in APPROACH nearly 4 years ago. The attributes of automatic versus manual separation on the Martin-Baker system were thoroughly and correctly discussed, and everything said is just as germane today as it was then. This, coupled with the fact that many of today's Martin-Baker riders were not in the flying business at that time, makes reprint of the article appropriate.

Read and heed!

CDR Bill Lassen, USN
Head, Life Support Equipment
Naval Safety Center

It Pays to Wait!

(Automatic vs Manual Separation on the Martin-Baker System)

By Roger Emett, Martin-Baker Aircraft Co.

AFTER ejection in the Martin-Baker H5/H7 seat, it takes far longer to achieve a full parachute with the manual override system than with the automatic ejection sequence, and a much greater loss of height is involved. Despite this, there have been some cases where pilots have ejected above barostat altitude and used the manual override for separation and manual parachute deployment using the ripcord D-ring when it would have been wiser to have let the automatic sequence do its job.

A tragic accident occurred in Southeast Asia when an F-4 backseater used this manual override handle unnecessarily. The crew had experienced flight control problems at low altitude but had managed to coax the crippled aircraft up to 16,500 feet before ejecting. The aircraft commander ejected without any trouble and was uninjured in the escape. However, the RIO's parachute did not deploy after ejection, and he was killed.

Investigation revealed the parachute ripcord handle D-ring still in the retaining clips, and the parachute link-line, which deploys the parachute under the

automatic sequence, cut by the guillotine. The body landed some 300 feet from where the ejection seat struck the ground. The emergency harness release handle had been used and had operated correctly to release the harness attachments and fire the guillotine. The seat automatics were put on test and, after "free-falling" from altitude, these items still checked out within prescribed tolerances. It was evident that the seat had functioned as designed. If the emergency harness release handle had not been used above barostat altitude, automatic seat separation and parachute deployment would have occurred.

In this particular case, the parachute D-ring handle was very tight in its retaining clip. It was found that a force of 70 pounds was required to pull it from the clip to permit manual deployment of the parachute. The lower stitching securing the ripcord handle retaining plate to the parachute harness had pulled away from the harness.

The actual sequence of events leading to this unfortunate accident may never be known for sure. However, available evidence suggests three main possibilities:

a. The copilot ejected, became anxious about the time elapsing while free-falling in the seat on the 5-foot drogue, and elected to use the manual override system. Then, having separated from the seat, he was unable to deploy the parachute because of the excessive force required to free the ripcord handle D-ring from the retainer clips, or

b. After ejection and subsequent manual separation, the copilot was incapacitated or made no attempt to deploy the parachute, or

c. The emergency harness release handle was used prior to ejection . . . reaching for armrest firing handles, as on other ejection seats, by mistake. This has been done a few times on simulator rides even with experienced F-4 aircrews. If such a thing occurred, the body would not be restrained and would "jackknife" under ejection loads. Injury or incapacitation would be inevitable if the seatpan ejection handle was then used. Seat separation would occur as soon as the drogues deployed and perhaps explains the fact of the seat and body impacts being 300 feet apart. Ejection was at low speed. If manual separation occurred when the man and seat had a vertical trajectory on the drogues, the two impact points should not be far apart. The broken stitching on the ripcord handle retaining plate is equally consistent with ground impact forces. Normally, it will take considerably more than the 70-pound force required to free the ripcord handle and, in this particular case, to break the stitching securing the retaining plate to the harness. To break the stitching without pulling the handle from its housing suggests a force in the opposite direction from the normal pull.

Whatever the answer, we must ensure that the circumstances of this accident are not repeated.

Time in Free-Fall on the 5-Foot Drogue

Few pilots have an accurate picture of the time required to free-fall in the seat from ejection altitude on the 5-foot drogue, waiting for automatic sequencing at barostat altitude. Most are prepared to wait a reasonable time, but what is a reasonable time in such a situation? Remember that your pulse will have been racing immediately prior to ejection. Although the decision to eject has been made, and the worst is over, the unusual sensations of the ride and the realization that there is more to come will not be conducive to relaxation! In any emergency situation, time seems to be compressed anyway. What is actually a matter of seconds may seem

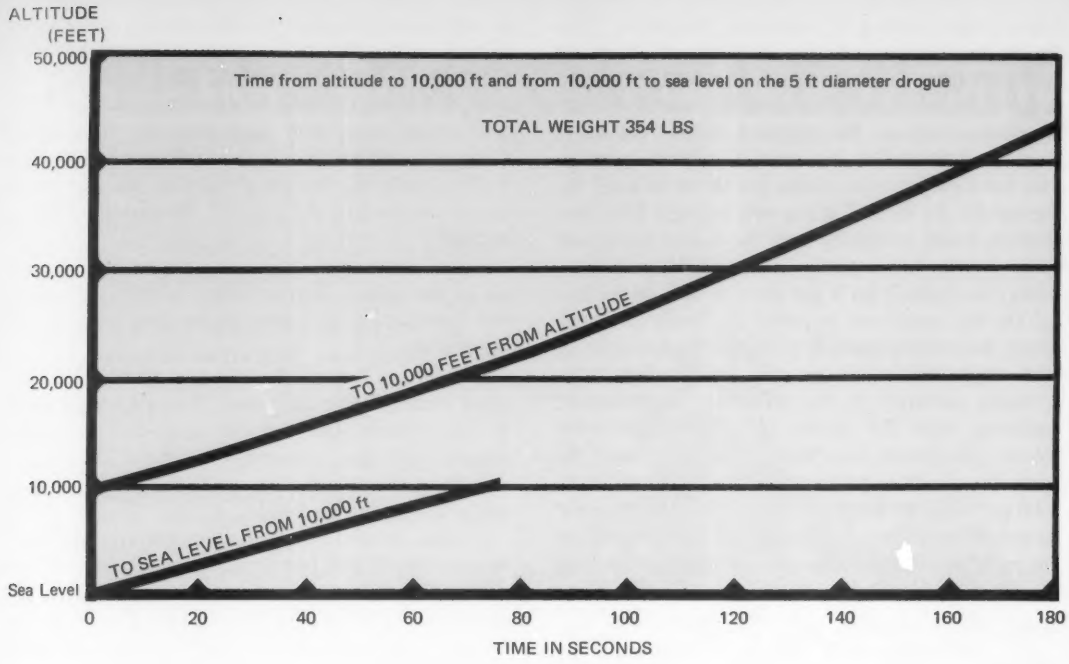


Fig. 1

like an eternity when you are heading for the ground at high speed.

How long would you be prepared to wait before being concerned?

Ideally, one should wait for the automatic sequence to function. *Let's analyze it.*

Automatic Versus Manual Separations

Automatic seat separation and parachute deployment is rapid and positive. Manual separation and manual parachute deployment is not.

After ejection, the drogues stabilize the seat and ensure optimum alignment for automatic separation and deployment of the personal parachute. This will be accomplished in less than 1 second from shackle release, in something like 150 feet, and with no risk of man/seat involvement.

In comparison, manual separation and manual parachute deployment is a time consuming and height wasting affair. The occupant must pull the emergency harness release handle to release the lap belt, shoulder harness, and leg restraints. Pulling the handle will also operate the guillotine to sever the parachute withdrawal link-line. Since the occupant will still be attached to the seat by the sticker clips, it will be necessary to lean forward to get the parachute off its horseshoe support arch, push away from the seat to break out the sticker clips, and clear the seat. All of this takes valuable time and altitude.

When clear of the seat, the ripcord D-ring handle must be pulled to full extension (3-4 inches) to open the parachute pack. But first you must locate the handle. If you are tumbling, and this is very likely, it may take longer than you think to locate the handle. Remember, the parachute pack will be free to swing around to the full extent of the risers and will not necessarily stay behind in relation to the body. If it swings forward, over the head for instance, the D-ring could be masked by the riser making it more difficult to locate and use. The thing to do is to look for it, then grasp the left parachute riser with the left hand just above the ripcord and pull the ripcord D-ring handle as hard as possible with the right hand. This will open the pack, but instead of the 5-foot drogue to draw the chute from the pack, there will only be a small pilot chute to do the job. As a result, parachute deployment will be less rapid.

Obviously, there is nothing to be gained by trying to beat the automatic sequence at low level. It could prove fatal.

Another incident in Southeast Asia illustrates the problems associated with manual separation and parachute deployment. An F-4 pilot ejected about 14,000 feet over the sea and rode the seat down on the

5-foot drogue waiting for automatic separation. When separation did not occur after an appreciable time and deck equipment was becoming distinguishable on ships in the water below, he rightly decided it was time to use the manual override. He separated without difficulty, then found himself in an inverted jackknife position with the parachute pack visible just above his head. He reached for the ripcord D-ring with his right hand but couldn't locate it initially until he looked for it and pulled it into view with his left hand. He pulled the D-ring but couldn't get it out of its housing on the first try. On the second try, he pulled the handle to its full extent, but nothing appeared to happen until he pulled a third time. The chute opened. (No further cable extension occurred, so the parachute was probably deploying after the second pull.) Since parachute descent subsequently took about 2 minutes to reach the water, the parachute probably deployed in the region of 2000 to 3000 feet. In this particular case, it took several seconds to separate from the seat and manually deploy the parachute. A significant altitude loss was involved. The pilot showed commendable presence of mind in dealing with the situation.

The circumstances of this incident suggest the possibility of barostat failure, but as the ejection seat was not recovered, the issue cannot be resolved. Damage to the barostat or to the time release mechanism itself would prevent automatic operation at the normal altitude setting (H5 seat 10-13,000 feet, H7 seat 11,500-14,500 feet). However, there are five separate capsules comprising the aneroid in the barostat. A leak in any of these would not negate the system, although, in such an event, barostat operation would occur approximately 3000 feet below the original altitude setting.

Failure of the Automatic Sequence

Complete failure of the automatic sequence is unlikely, but the possibility cannot be ignored. And since manual separation, with all its drawbacks, is the only alternative, one must know how to recognize a failure and take prompt action should it occur.

If the seat does not stabilize almost immediately after ejection, failure of the drogue gun or the drogue assembly would be indicated. The drogue gun fires 1.0 seconds after ejection on the H5 and 0.75 seconds after ejection on the H7 seat. If the seat does not stabilize but continues to tumble, prompt action to pull the emergency harness release handle is required, for if the time release mechanism delay runs out, allowing the occupant to tumble from the seat before the guillotine is fired to sever the parachute link line, the seat would remain attached to the apex of the parachute during descent!

Failure of the time release mechanism also requires use of the manual override system to avoid riding the seat down to ground impact on the drogues, while still strapped in.

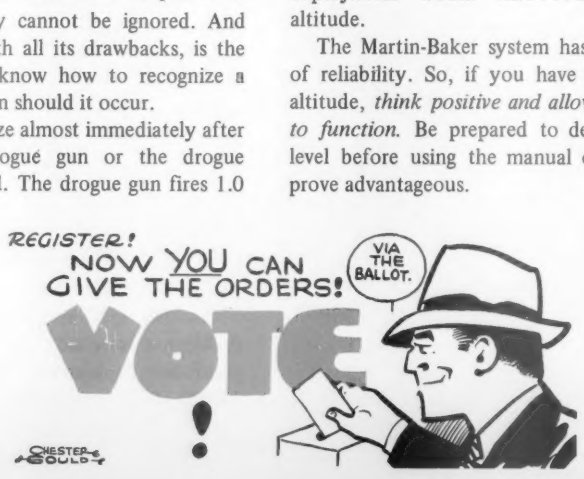
At night, or in a weather situation where there is no visual reference with the ground, it would be impossible to tell without knowing the approximate ejection altitude and time required to descend to barostat altitude on the 5-foot drogue, whether or not the time release mechanism has failed.

It takes about 2 minutes from 30,000 feet and over 1 minute from 20,000 feet to fall to the 10,000-foot level on the 5-foot drogue. Automatic seat separation and parachute deployment occur between 10-13,000 feet on the H5 seat, and between 11,500-14,500 feet on the H7 seat. (See Fig. 1.)

If the system failed at barostat operating height, then it would take another minute, at least, to fall to sea level. So, in most circumstances, there is usually time to spare after a high-altitude ejection, depending on the local terrain.

In all ejections, one should plan to use the manual override handle *only* if the automatic system fails . . . except for rare occasions over mountainous terrain where ground level approaches barostat altitude. In the latter case, it will require very prompt override action after ejection to achieve a full parachute on the manual system in less time than the automatic deployment would take . . . depending on ejection altitude.

The Martin-Baker system has an outstanding record of reliability. So, if you have to eject above barostat altitude, *think positive and allow the automatic system to function.* Be prepared to delay to the 10,000-foot level before using the manual override. It will usually prove advantageous. ◄



A Flathat May Cover A Fathead

Jeremy A. was a bold DNA,
The scourge of the ether was he.
He zoomed o'er the nation without reservation,
Blithe spirit, unfettered, and free.

He showed off his skill by buzzing each hill,
Each farmhouse, each valley, each town.
His episodes shady had frightened each lady
And gent in the countryside round.

Evincing no care for the rules of the air,
Ignoring such constraining matters,
It was strictly the whim of the moment for him,
The flattest of all the flathatters.

He waited one day, did Jeremy A.,
To launch on a hop with J. Brown.
The yellow sheet told of malfunctions untold,
The aircraft was certainly down.

"Not me," said J. Brown, with incredulous frown,
"I ain't going up in that crate!"
"Well, *I'm* going, kid!" said A., and he did,
And the outcome we now must relate.

A. knew a chick who lived by a crick,
And decided to give her a buzz.
His rule violation caused no consternation,
He feared not the aerial fuzz.

While performing his trick for the chick by the crick,
His engine began to lose power.
At one-five-oh feet, its irregular beat,
Convinced him to contact the tower.

As he started his try to get back on high,
The engine gave one final wheeze.
While he searched all around for someplace to set down,
The aircraft met up with the trees.

The moral is that, if you're out to flathat,
Think of Jeremy A. 'fore you try it.
If you're going to toss out common sense and all doubt,
Don't buzz the farm, you may buy it.

By LT Norm Lane, MSC, USN

A READER has written to say that he is impressed with the aviation safety program at the command where he performs CRT. He credits the safety and NATOPS officers with having done much to strengthen the program. In support of this view, he provided a copy of a recent safety note – reprinted below – published by the safety officer. Some readers may disagree with the safety officer's approach, but others will applaud him. In any case, all are sure to agree that here is an ASO who believes in safety and is doing his best to communicate this philosophy to those he serves.

Disgusted

I don't understand why, but I continually hear of pilots *not* adhering to NATOPS. For example, recently a pilot took off in an S-2 without rudder assist and, while climbing through 400 feet, reduced power from max to cruise. This is outright stupid! What would have happened if, while passing 450 feet, the pilot had lost No. 2 engine? You're right, he probably would have bought the farm. If I sound disgusted and uptight, I am!

As a safety officer, I operate in the same manner as the chaplain. I can preach to you all day long; and, if you're sitting across from me, you would be the first to criticize any pilot who disregarded safety. But . . . put you in an S-2 and some of you forget everything you've been taught.

I can compare it to drug abuse. If you have kids, I'm sure you're concerned about drug abuse and try to educate your kids to be intelligent and refrain from using "Speed," "Skag," etc. But instead of setting the example, you show your lack of intelligence by refusing to wear your seatbelt while driving to NAS and by jumping into an airplane and disregarding NATOPS. Maybe you are jeopardizing your life, as well as your crewmembers, in order to demonstrate how "cool" you are. Maybe you want to show that you're no dummy. You can fly a *Stoof* without rudder assist. Hell! Who needs it? Right? Or maybe it's, "Watch how fast I can do the runup. I don't need the checklist. I've performed too many times without it."

I'm sick of hearing phrases like, "I never did it this way in my old squadron"; "We never wore hardhats"; "I don't want to use the rudder assist because it may not function properly"; and others similar to these. You can badmouth NATOPS until you're blue in the face, but I guarantee that it'll be *you* doing the explaining at the "Long Green Table."

The following are but a few of the problem areas I have observed:

- *Ignorance.* Due to the requirement of flying only 4 hours a month, you are not up to speed on many NATOPS procedures.
- *Complacency.* You have 4500 hours, and you feel that you know enough to handle any situation. But how many times do you practice approaches? How many *really* practice single-engine procedures? Considering the "pucker" factor, do you really believe you could handle a single-engine on takeoff? Now be honest with yourself. You don't have to impress me. (You might make a good impression on the ground, however – when you land short!)
- *Showoff-itis.* It is my firm conviction – and I must admit I've been guilty – that 99 percent of all pilots seek to impress others who have a lesser degree of knowledge in the same aircraft. How many of you do things in the cockpit to impress the copilot or to show him you're an "old salt"? Tell him as many sea stories as you like, but don't demonstrate poor attitude, procedures, etc. Remember, if you do in fact impress the copilot, he may attempt to copy you. If you were the inexperienced copilot, would you appreciate such performance from the pilot?

Let's be honest with each other. I realize that flying once a month to get your 4 hours is, at best, a poor program. It's frustrating to drive all the way out here and then find an S-2 with multiple marginal gripes. But since we have to live with the program, why not accept it and be the professional you try to make everyone believe you are.

If you've read this far, I appreciate your attention. Don't be as hypocritical as the man who attends the Sunday worship, but daydreams about what he's going to do after the service. You *must* ensure that you and those flying with you maintain a professional attitude toward CRT flying. ◄

Naval Aviator? Commercial License?

By J. E. Berta
FAA Liaison, Naval Safety Center

We often receive the question, "What are the proper procedures to follow to obtain an FAA pilot certificate?" The information is covered in detail in several FAA publications, which may or may not be common knowledge. FAA Advisory Circular AC 61-34A contains a wealth of information to prepare you for a written test. We have shortened this AC somewhat, but hope the information offered will be of some benefit.

Continued

Federal Aviation Regulations Test Guide For Private, Commercial, and Military Pilots

THE FAA recognizes that most rated pilots of the military services have the experience necessary to satisfy the experience and skill requirements for civilian flying. In the area of knowledge as it relates to regulations, however, the military pilot may not have all the information he needs to operate as a civilian pilot. For this reason, Part 61 of the *Federal Aviation Regulations* sets forth the requirements for qualified persons who wish to obtain a private or commercial certificate. After a study of this material, it will become apparent that the test required by Part 61 is based on knowledge of the applicable regulations. Relative to the written test, the requirements are the same, whether the applicant is interested in the private or commercial certificate.

In essence, Part 61.31 states that under the conditions prescribed, relative to experience and flying status, military pilots may be certificated as private or commercial pilots if they pass the written test based on test items relating to:

1. Pilot privileges and limitations,
2. General operating and air traffic rules, and
3. Accident reporting rules.

If the military pilot applicant presents satisfactory evidence of meeting the stipulated requirements for experience and flying status and passes the written test on regulations, the FAA office where he takes the test will issue him a temporary certificate. A permanent certificate will be sent to him within 90 days.

As previously indicated, the test for military pilots is concerned entirely with Federal Aviation Regulations and National Transportation Safety Board Safety Investigation Regulations, Part 430. Today, commercial and private pilots may be flying aircraft with performance parameters which, at one time were found only in the larger and more complex air carrier and military aircraft. Consequently, pilots of all experience levels are engaging in flying operations which require knowledge and application of those regulations which pertain to airman privileges and limitations, as well as the safety of operations on the ground and in the air. The test for military pilots is based on multiple-choice test items which may be answered by selecting one response from the four presented. With few exceptions, the test items are applicable to all pilot certificates and categories. In the interest of safety, however, pilots should be familiar with the few regulations that are peculiar to a specific aircraft category or pilot certificate. Such test items, germane to knowledge requirements as established by FAR 61.31, are comparatively few in number, and their inclusion should create no problem for the informed applicant.

For certification purposes, military pilots are required to take a test based on regulations alone. Civilian pilots must pass a test on other appropriate subjects.

The military pilot may take the test on regulations at any FAA Flight Standards General Aviation District Office and most Air Carrier District Offices. The applicant is allowed 2 hours to complete the test. One may not be permitted to start the test if this amount of time is not available. The tests for civilian candidates for private and commercial pilot certificates include many subjects; therefore, more time is allowed. These tests may be taken at all General Aviation District Offices, most Flight Service Stations, and many Air Carrier District Offices.

Grading of the test for military pilots is accomplished at the office where administered. If a passing grade of 70 percent is not obtained, a "Notice of Disapproval of Application" (FAA Form 66) is issued to the applicant. This form should be presented upon application for retesting.

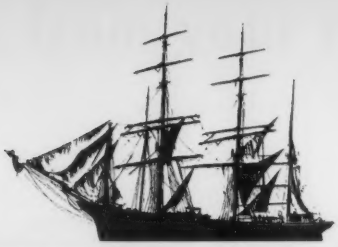
Study materials may be obtained by remitting check or money order to the nearest U.S. Government Printing Office Bookstore. They are also available for review at any FAA ATC facility. To get GPO publications promptly, use an order form, not a letter, unless absolutely necessary. Order forms, *which may be duplicated by the user,* are included in the catalog "FAA Publications," sent free upon request from:

Distribution Unit, TAD 484.3
Department of Transportation
Washington, D. C. 20590

There are also many excellent commercially prepared textbooks, audio-visual training aids, and programmed instruction courses, which may be helpful in preparation for the written test.

(This article is presented in the belief that broader knowledge of flying regulations and understanding of other facets of the profession will increase safety in the air for all – our common goal. – Ed.) ◄

NAVY DAY



13 October 1775-1972

Pride and Professionalism

ON 13 October 1775, the Continental Congress authorized the acquisition and construction of the first ships for the United States Navy. The greatest Navy in the world was thus born.

During the past 197 years, our Navy has proven superior in its quality of ships and men. Pride and professionalism were two assets of that young Navy which helped launch our great nation, and became the catalyst to accelerate the tremendous growth which followed.

Today, as in 1775, the same pride and professionalism are evident as we sail the largest and most sophisticated ships ever built. Modern technology and specialization has not stifled professionalism. The pride and personal satisfaction of a job safely done is still prominently exhibited.

Both toggles of the LPA-1 life preserver have been pulled here, inflating the waist and collar lobes. The toggles of the LPA-1 must be pulled in right-left sequence.

Here the right toggle of the LPA-2 has been pulled, inflating the right waist lobe and the left neck lobe. Either toggle of the LPA-2 can be pulled first.

LPA-1 Life Preserver

AFTER ejection and water entry, a pilot pulled the left inflation toggle of his LPA-1 life preserver first. He was subsequently unable to pull the right toggle.

The design of the LPA-1 necessitates pulling the right toggle first for maximum inflation. The right toggle inflates the neck lobe and part of the right waist lobe of the life preserver. The left toggle inflates the waist lobes. When the left toggle is pulled first, there is full inflation of the left waist lobe, and some inflation of the right lobe.

Once the left lobe is fully inflated, it is hard to actuate the right toggle. Carbon dioxide entering the right lobe when the left lanyard is pulled binds the nylon release pin on the right side when the right toggle is pulled. Many aircrewmen fail to actuate the right CO_2 bottle because they incorrectly assume that the release of the right lobe case pin constitutes puncture of the CO_2 cylinder.

The investigating flight surgeon strongly recommends that the LPA-1 be modified to operate equally well, no matter what sequence of lanyard actuation is followed.

"This was a very controlled ejection situation," he states, "yet the pilot still forgot to actuate the right lanyard first. I feel that in the moments immediately following an ejection, when the pilot usually experiences confusion and shock to some degree, he should not have to remember to pull the right lanyard of his LPA-1 first to ensure proper inflation. This is especially true in the case where injury occurs during ejection, or the ejection occurs under extreme conditions such as immediately after a night catapult launch."

The Naval Safety Center agrees, and we're happy to report something has been done about this problem.

The necessity for pulling the right lanyard before the left has been eliminated in the design of the new LPA-2. (An initial shipment of 4200 LPA-2s has already reached the Fleet.) Actuation of either the left or right inflation toggle of the LPA-2 will partially inflate all lobes.

According to NAVAIRDEVCEN (Naval Air Development Center), reliability has been improved in the LPA-2 through use of a simpler construction technique. This also reduces the life preserver's bulk when it is stowed. As a result, the LPA-2 should prove more compatible with other flight equipment and survival gear worn by aircrewmen.

NAVAIRDEVCEN has advised that a change to NAVAIR manual

13-1-6.1, Inflatable Survival Equipment, is being prepared to cover maintenance of the LPA-2. No additional spare parts support is considered necessary because only the flotation chambers have been changed.

Under Control

WITHOUT warning, at 2000 feet, the pilot and bombardier-navigator of an A-6 heard an explosion and felt windblast and cold. The right half of the canopy was gone.

Both men were wearing oxygen masks and had their visors down. This protected them from flying fragments of Plexiglas.

"The fact that no injury was sustained," the investigating flight surgeon reports, "undoubtedly allowed the crew to assess the situation and return to base in a controlled manner."

Pop-Top

HAVE you ever seen someone pop the flip-top opener off a soft drink or beer can, drop it into the can, then start drinking? Until we read a recent injury report on the subject, we had never noticed anyone doing this. After that, it was everywhere we went.

Here's a brief of the report:

A sailor popped the top off a coke can. Then, instead of throwing it into the trash, he broke off the aluminum flap, folded it around the pull ring, and dropped the whole thing into the can. As he drank his coke, the pop-top came out of the can, and he swallowed it. It lodged in his esophagus.

At sickbay, the doctors were unable to remove the top. The sailor remained in sickbay several days for observation with surgery a possibility.

Nature, however, took care of things. The top became dislodged and passed through his GI tract – apparently causing no internal injury on its way out.

Next time, please throw your pop-top in the trash.

Fatigue Contributes

CAUSAL factors contributing to a T-39 accident on a cross-country were 1) the plane commander's miscellaneous errors due to carelessness and haste and 2) the copilot's improper technique on landing rollout. A *probable* contributing cause, investigators said, was pilot fatigue.

The pilot and copilot had spent a strenuous weekend of hiking and fishing in the mountains. They had gotten up at 0700 the day before and had hiked and fished in the morning and early afternoon. When the accident took place at 0025 the "next day," they had been 17½ hours without sleep.

"More strict guidelines on the conduct of such cross-country flights have been instituted," an endorser to the investigation report wrote. "The factors of pilot headwork, complacency, fatigue, and deviation from NATOPS procedures in this mishap, however, indicate that, while such steps may reduce the possibility of future mishaps of this nature, there is no substitute for sound judgment and sense of responsibility among pilots."

Dropout

DURING the 5 days between paraloft check of a PRC-63 and a pilot's ejection, somebody dropped the radio but didn't turn it in to have it checked for possible damage. When the pilot tried to use the radio, it beeped for a few seconds, then failed completely.

Because of the lack of a functioning radio, other equipment losses and failures, plus SAR delays, the pilot floated in his Mk-3C for nearly 3½ hours in cold water before being rescued. (He had to release his seatpan because it was tangled in shroudlines.)

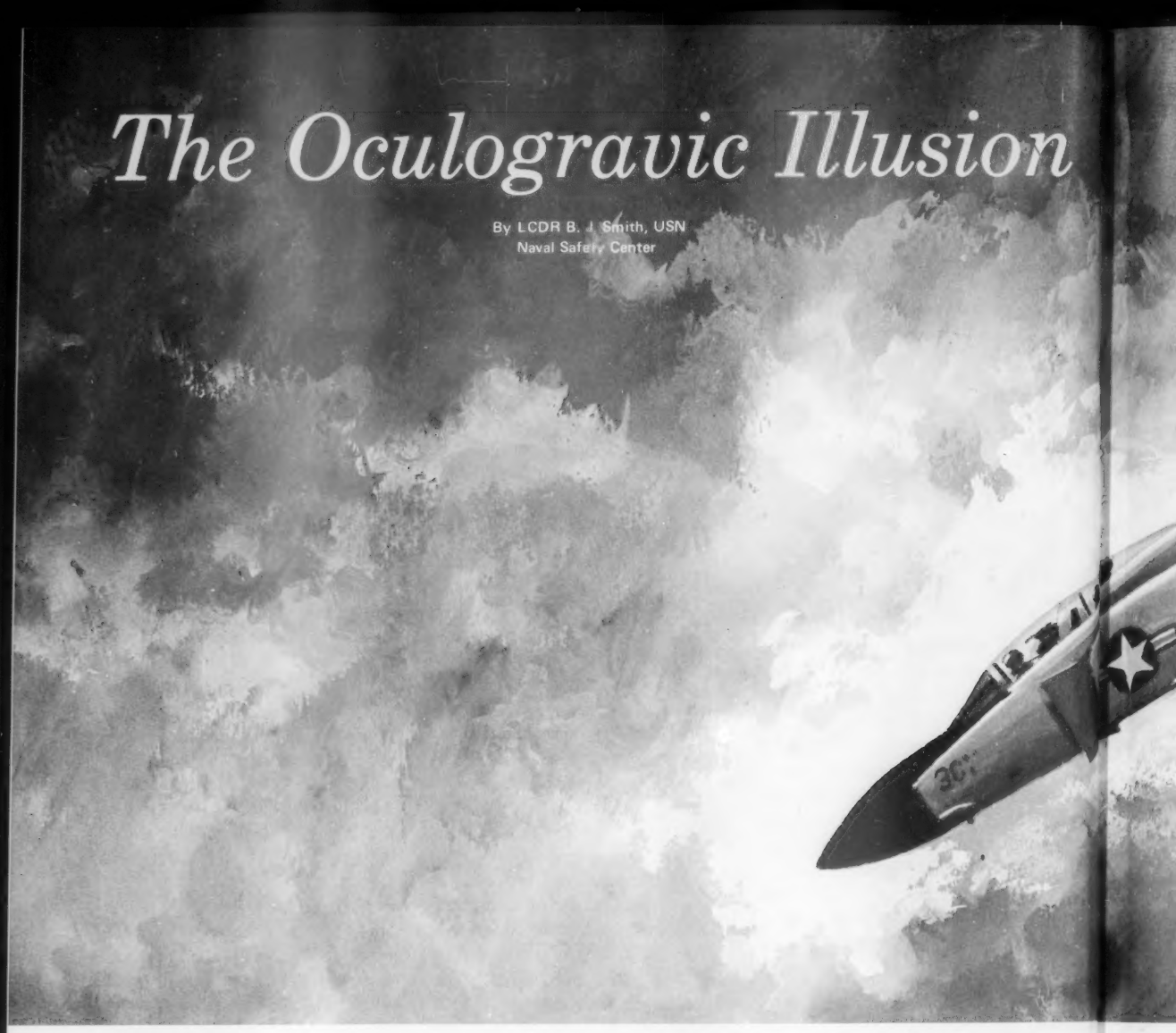
After it was all over, investigators found that the radio had a cracked battery. With a new battery, the PRC-63 functioned normally.

"It should not be – but apparently is – necessary to point out to pilots," the accident investigation report states, "that abuse or accidental damage to survival gear requires thorough reevaluation of that gear by appropriate persons. Whoever dropped the PRC-63 should have returned it to the parachute loft for disassembly and inspection. This would have revealed the cracked battery and probably would have prevented the failure of the radio in a time of most urgent need."

If you drop a piece of survival gear such as a radio or beacon, turn it in for examination, even though it may not look damaged . . . just to be on the safe side. ◄

The Oculogravic Illusion

By LCDR B. J. Smith, USN
Naval Safety Center



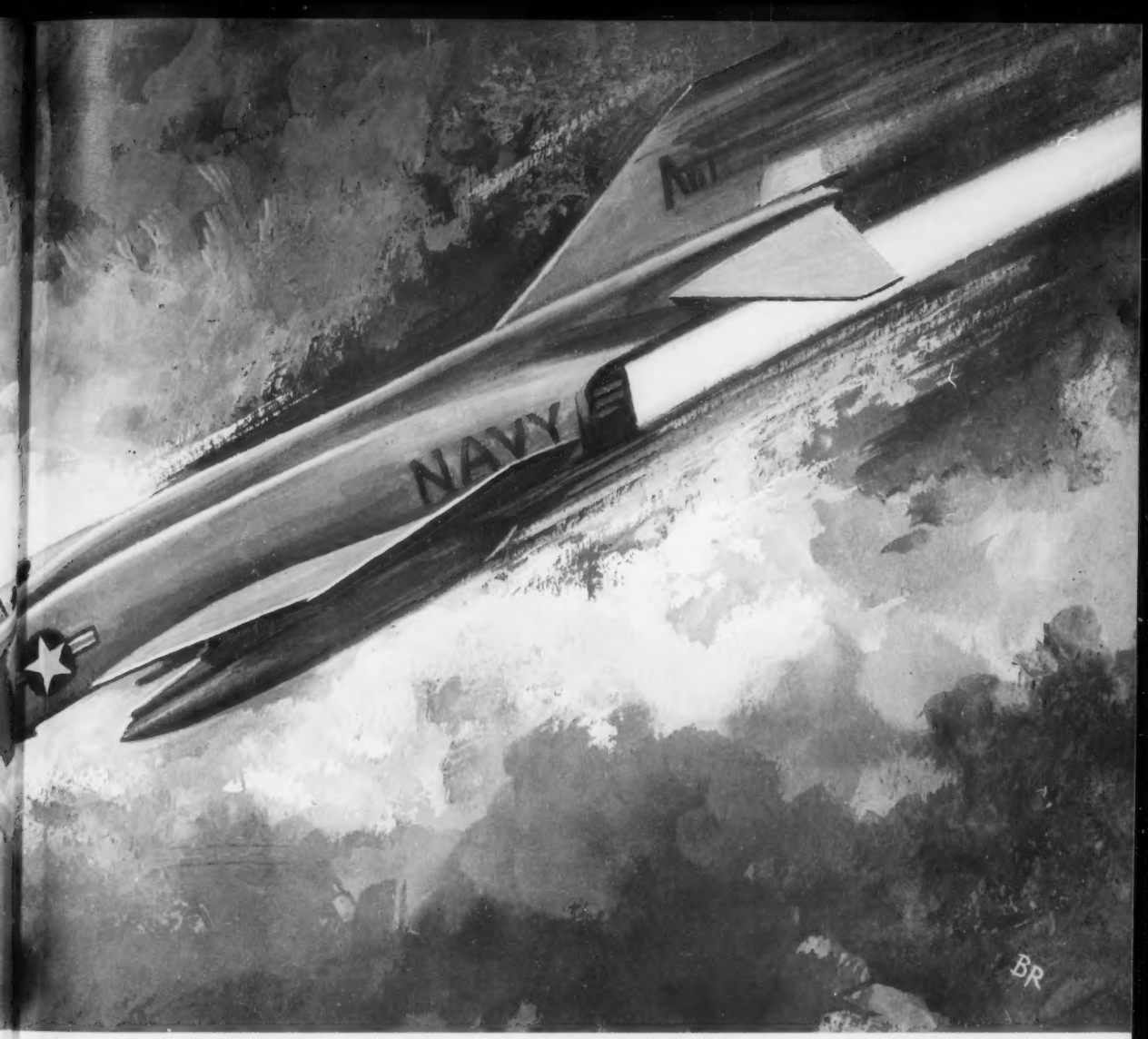
TWO similar accidents involving high-performance aircraft occurred recently, resulting in the destruction of both aircraft and the loss of two pilots and two NFOs.

What did these fatal mishaps have in common?

- Both accidents occurred at night, subsequent to the aircraft entering IFR conditions.
- Both aircraft were lightly loaded and capable of a one-to-one thrust to weight ratio.
- Both aircraft were observed emerging at high power from an estimated 600/800-foot overcast in a wings-level, nose-low attitude, which remained unchanged to impact.
- All four crewmembers were in training for their first operational tour. They most probably were not familiar with the disorientating effects of high linear acceleration in an IFR environment.
- The NFOs were involved with frequency changes and most probably were not intent on maintaining a proper instrument scan.

After a thorough study, investigators ruled out powerplant, airframe, or control system malfunction as a causal factor in either accident. Why, then, did these accidents occur?

Investigators believe that the most likely cause of



these two accidents was *oculogravic illusion* – a disorienting phenomenon resulting from acceleration in the IFR environment.

Just what is oculogravic illusion? Without getting too technical, I'll try to explain it and relate it to flying high-performance aircraft.

Your body has several means of sensing orientation in space. Your vestibular apparatus, position sensors in muscles, tendons, and joints, and the very important visual system all relay information concerning spatial orientation to your brain. The brain assembles these various inputs and provides you with a picture of "where you are."

When the indispensable visual input is missing, your brain must determine body position using less information. *The chance for error in the correlation of the sensory inputs increases when one of the standard inputs is missing.* Thus, IFR conditions, eliminating visual references, increase the possibility of the occurrence of disorientation.

The oculogravic illusion can occur in IFR conditions when you are accelerating in a high-performance aircraft. Your brain, acting without a visual input, treats the acceleration of the aircraft and the pull of gravity as

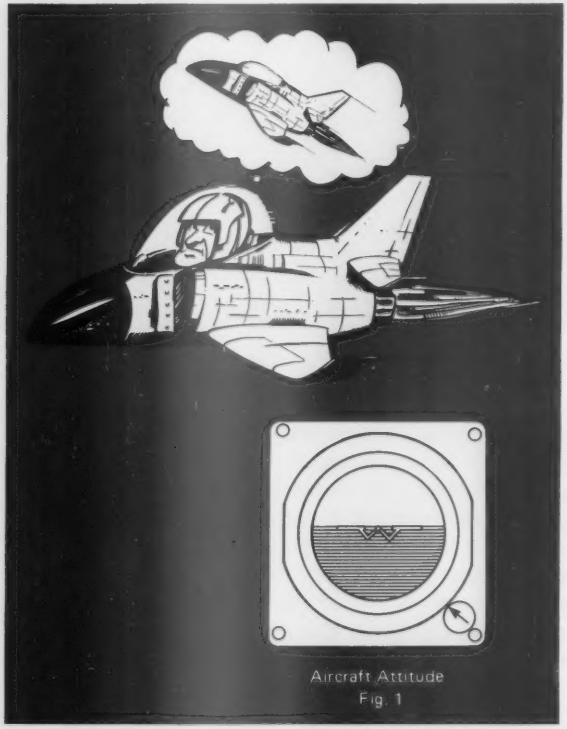
only one acceleration, and you become disoriented.

On the ground, we expect the vertical direction (upward) to be in the direction opposite that of the 1G gravity vector. In the air, however, the resultant G vector does not always point in the same direction as the gravity vector. For example, if a pilot accelerates an aircraft forward at the rate of 32 feet/sec^2, there would be a 1G inertial vector pulling him posteriorly. The resultant 1G gravity vector would combine with the 1G inertial "force" vector to result in a 1.414 resultant vector pointing posteriorly and down. This is halfway between the vector representing the pull of gravity and the vector representing the inertial forces resulting from the aircraft's acceleration.

The pilot, imagining "up" to be in the direction opposite that of the resultant vector, would then perceive the horizontal plane to be 45 degrees down from the nose of the aircraft (Fig. 1). If he were to correct for the apparent nose-up condition, he would push the plane over to an angle of 45 degrees (Fig. 2).

The oculogravic illusion does not occur if adequate outside visual reference is available. But if the pilot is flying without visual references, as in instrument weather or on a dark night, he is susceptible to the illusion. If he then tries to fly his aircraft according to the perceived horizon, *he will fly into the ground*.

Aircraft Attitude
Fig. 2


Aircraft Attitude
Fig. 1

As an aircraft accelerates in IFR conditions, the oculogravic illusion will affect both the pilot and the NFO, but especially the pilot, as his instrument scan has a greater tendency to decay due to concentration on the physical forces which he is required to exert to overcome the longitudinal out-of-trim condition he is generating. The NFO, realizing this, *should not* be distracted from his instrument scan and should inform the pilot as soon as he detects a loss of altitude.

Maintaining a constant airspeed or accelerating at a slow rate in an IFR environment will preclude oculogravic illusion. What else can be done to alleviate this problem?

A pilot who continually relies on his instruments in IFR conditions and ignores his false impressions can prevent the oculogravic illusion. *Recent instrument experience is the best preventive measure for avoiding disorientation while flying.* A pilot must be aware that, when he is accelerating in IFR conditions, only his instruments present a true picture of his orientation in space.

The oculogravic illusion does not cause accidents in VFR conditions when a clear horizon is available as a reference. When the horizon is not available, as in some VFR and all IFR conditions, your instruments provide the necessary visual cues. Heed them!

Habit Pattern Transference

By LTCOL C. W. Gobat, CO, MARTD Detroit

WITH the acquisition throughout the Wing of new types of aircraft and associated support equipment, one potential hazard is often overlooked in our safety program: Habit Pattern Transference.

By definition, habit pattern transference is "inappropriate patterns of automatic behavior." Habit simply means that an act has been repeated so often that it becomes automatic with the individual concerned. Good habits are what we create while learning and practicing emergency procedures and are assets. But if the habit is carried or transferred to a different environment, it can become inappropriate and dangerous.

If a helicopter pilot utilizes helicopter procedures to prevent "overshooting" while transitioning to a fixed-wing aircraft, the results might well be disastrous. If a plane captain accustomed to jet aircraft approaches an OV-10 in a like manner, disaster is again a possibility. The examples can be enumerated endlessly. Habit pattern transference becomes a dominant problem under conditions when the situation is similar and the individual has strongly ingrained habits.

Habit transfer can be induced by fatigue. The more tired one gets, the less thinking he does and the more he functions automatically. The use of a new item of support equipment with basically the same function as the item replaced is conducive to habit pattern transference. The mechanical functions of the individual using the new equipment might be similar; however, the results can be damaging to the aircraft, to the equipment itself, and often to the operator.

How can we attack the problem of habit transference? First we must be aware of this potential problem and believe that it does exist. With this understanding we can recognize and try to avoid the dangers of similarity and fatigue. In the cockpit we utilize checklists whenever possible. In this manner we consciously eliminate the possibility of regressing to a previously learned procedure by substituting a written one outlining the desired routine. This same procedure must be utilized in all facets of aircraft flight and maintenance.

In summary, whenever procedures and/or equipment are changed and something you previously learned to do automatically is inappropriate, be aware that habit pattern transference is a potential problem. Thinking through the new procedure and learning it better than the old one will keep us on the right and safe track.

4th MAW *Safety Sentinel*

Catawampus Crusader

TWO F-8s on a day instrument training flight filed a roundrobin stopover flight plan to land and refuel at a distant base. Weather at Homefield was clear and seven with destination forecasting 3000 scattered, variable broken and seven.

Shortly after takeoff, the PUI (pilot under instruction) flying lead, experienced TACAN failure. The two pilots discussed the problem on tactical and since there were no other discrepancies, the flight leader (chase) decided to continue.

Approaching destination, the PUI requested a random radar approach which was denied due to nonavailability of radar. Instead, the flight was cleared to the initial approach fix for a TACAN penetration and advised that the weather was 800 broken, 3000 over with 4 miles visibility.

At this time neither pilot considered diverting to an alternate. Nearing the initial approach fix, the pilot under instruction passed the lead to chase. Chase decided he would rather fly wing and returned the lead. However, he would furnish azimuth and distance information.

After descent to 1200 feet and handoff to GCA, the section approach continued, anticipating glide slope information. They were now VMC.

At 4 miles, still with no glide slope information, chase assumed they would have to make a contact approach. Since he had not activated the return portion of the flight plan, he requested that GCA do so. A discussion followed and GCA advised the flight to take over visually and complete the landing. It was planned for lead to land on the first pass and chase go around.

The PUI touched down fast and began to porpoise. To correct this, he went to military rated thrust. He informed the tower that he was taking it around. He also reported an unsafe nosewheel, but seconds later reported it safe. He then requested a VFR turn around the field. This was denied because of insufficient separation from the chase aircraft (then making a go-around and not in sight of the tower).

Instead, he was directed to climb straight ahead (heading 360 degrees) to 2000 feet. He leveled off at the assigned altitude in dirty configuration: wing up, droops extended, flaps down, gear down, and 180 KIAS.

About 6 miles north of the field, he was given a left turn to a heading of 270 degrees. He acknowledged and turned left with 30 degrees of bank indicated on the primary attitude gyro. After progressing through 60 degrees of turn (to a heading of 300 degrees), he noticed the primary attitude indicator rapidly increase bank to 60 degrees then to 90 degrees left wing down.

The pilot moved the stick rapidly to the right, but noted no decrease in bank. His altitude was 1500 feet

and decreasing. Considering the situation out of control, he pulled the seat pan ejection handle. It hardly moved. Looking down at the handle, he exerted a much greater force and was ejected. Ejection was successful and the pilot was rescued uninjured. The aircraft was destroyed.

Investigation of the wreckage failed to produce any evidence of equipment failure. In fact, there was substantial evidence to the contrary. It was concluded that the pilot became disoriented and ejected without taking full advantage of all attitude instruments. His scan had so deteriorated that he did not observe the turn and bank indicator, vertical speed indicator, airspeed indicator, or RMI after his hasty attempt to level the aircraft.

Supervision was a factor in this accident. The pilot was previously qualified in the F-4 and was transitioning to the F-8. He had a total of 14 hours in the F-8 and had completed three of five scheduled instrument training flights. He had not flown an instrument check, neither did he have the required 25 hours in type.

This accident might have been avoided had the pilot received adequate training and his progress been more closely monitored. It was a needless waste.

Bravo Zulu

MAJ. Edward F. Townley, Jr.,USMC

SHORTLY after takeoff on a flight from MCAS El Toro to NAS Alameda, MAJ Edward F. Townley, Jr., USMC, experienced difficulty with his A-4C *Skyhawk*. He had just received a radar vector from Los Angeles Center when he experienced a series of violent chatters, shudders, and chugs. His engine began to unwind. Altitude was 13,500 feet.

Major Townley selected Mode 3/Code 7700 (emergency) on his IFF and attempted to notify the Center, but his radio had failed. He deployed his emergency generator and noted the fuel transfer and firewarning lights illuminated with RPM decreasing through 60 percent. In his rearview mirror he could see flames.

Realizing he was over greater Los Angeles, he delayed ejection. He turned the aircraft westward toward the sea and decided to eject once the aircraft was clear of the heavily populated area. During the turn the entire master caution panel illuminated. Control response became sluggish. Crossing the coast, the aircraft began a series of falling leaf oscillations. He was unable to control these with either aileron or rudder.

Suddenly, the *Skyhawk* pitched violently noseup, rolled inverted, and spun. He could see flames over the top of the canopy extending to the windscreen.

He released both hands from the stick and ejected using the lower firing handle. The ejection was successful.

Landing just offshore, he was rescued by a harbor police boat. The tail section of the A-4 fell into the surf along the beach, while the main part of the aircraft crashed about ½-mile offshore. There were no injuries nor was there any reported property damage.

Major Townley, by his cool appraisal of the situation and calm, deliberate actions, succeeded in averting major property damage and multiple personnel injuries on the ground. For his display of outstanding professionalism —

Well Done.

The Constellation Perseus.

Letters

Sanyo Flashlight

FPO, New York – In the January 1971 issue of APPROACH, you featured a letter from CAPT R.V. Sabia, USMC, showing his use of a rechargeable flashlight as a safety backup cockpit lighting aid.

My predecessor had purchased one of these Sanyo lights while deployed to the Far East and found it to be "an invaluable piece of flight gear for use during night flight operations." We have attempted to find a CONUS source for open purchase with no success.

Would you, or any of your readers, happen to know whether the Sanyo rechargeable flashlight is available in CONUS and, if so, from whom?

R. O. Farris
VA-66

● We're sorry we don't have this information. If any of you readers do, please communicate directly with the writer of the above letter and send us a copy.

Helmet Tape

FPO, San Francisco – In a recent HC-1 DET 6 rescue, the pilot of the rescue aircraft noted the high visibility of the reflective tape on the cranial helmets (worn by helo passengers) floating in the water that dark night. The experience of the pilots in this detachment has shown reflective tape to be extremely effective at night. Very little light will make the tape shine like a beacon.

This detachment installs reflective tape on all its cranial helmets. We recommend that reflective tape be mandatory on all such passenger-type helmets used aboard ships or aircraft.

J. M. Quarterman, Jr.
Officer in Charge
HELSUPPRON ONE, DET SIX

● Since there is a requirement for aircrewmen to have reflective tape on *their* helmets, it seems logical for passengers to have it also. Once passengers are in a water survival situation, they're in the *same boat* (predicament) as the aircrewmen.

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request.

Address: APPROACH Editor, Naval Safety Center, NAS Norfolk, Va. 23511. Views expressed are those of the writers and do not imply endorsement by the Naval Safety Center.

Bravo Zulu

Alexandria, La. – Regarding "Bravo Zulu," APPROACH, June '72, p. 44, LT Charles E. BROWN, VA-46; Excellent! Indeed "Well Done!"

However, I note in the photograph that LT BROWN, apparently, is wearing (1) a scarf of some type (extremely dangerous during ejection/emergency egress); (2) a wedding ring and (can easily lose a finger – even posing for a photo); (3) a fore and aft cap (FOD).

I hope this is a posed photograph. Even so, this type of photo doesn't seem to be in keeping with the always safety-conscious theme of APPROACH.

This is not meant as criticism, nor in any way to detract from LT BROWN's superb display of professionalism but, rather, to suggest possible bad influence on less experienced aviators who might see the photo.

LCDR (MC) James A. White, USNR

● C'mon doc, you're nitpicking – Charlie wasn't getting ready to launch – and no engines were turning during the PAO-type photo session.

About the hazard of wearing the ring – though – you're 100 percent correct. People who wear rings in our business are gambling they won't get hung up. Most won't – but a few . . .

Light Up

MCAS (H) New River, N.C. – In response to the "Light Up" letter by Capt Buscemi in the May '72 issue of APPROACH, let me invite night-over-water SAR suggestions from the entire Navy/Marine Corps helicopter community.

As model managers of the UH-1N, we are presently studying methods to provide sufficient natural or artificial visual cues to include types of lighting devices, lighting patterns, and methods of delivery to develop procedures for the night SAR section of our NATOPS

manual. Hopefully, in the near future we will have authorization to evaluate some of these procedures.

Since the UH-1N will not be equipped with automatic approach and hover capability, we are interested in any procedure or suggestion that would enhance the safety of the night SAR mission.

CAPT S. R. Boulton, USMC
NATOPS Officer
HML-167, MAG-29

Good Words

Edwards Air Force Base, Calif. – My congratulations to you on publishing an excellent safety publication, APPROACH.

The magazine is one of the most informative and interesting of the several service publications in print. Each issue is eagerly awaited and utilized extensively here from casual reading to providing articles for safety meetings and briefings.

With articles of current interest and attractive art illustrations, the magazine promotes interest in safety to all who come in contact with it. Keep up the good work.

CAPT William C. Smith, USAF
AFFTC Flying Safety Officer

Arcing Downwind

NAS Norfolk – In reference to Captain Axtell's letter on "Arcing Downwind" in the July 1972 APPROACH, I have practiced this procedure a great deal since I was first taught the method during basic flight training in 1952.

Success is mainly dependent on the width of the runway and is affected by such variables as speed at touchdown, deceleration rate of the aircraft, runway traction, aileron and rudder effectiveness during rollout, etc. On a very narrow runway, however, the procedure is impossible, simply because there is no room to arc. At the other extreme, where an infinitely wide runway is available, there would be no need to use the "arcing" method because the aircraft could be landed directly into the existing wind.

With considerable F-8 and F-9 experience, I will definitely recommend against the "arcing" method when landing on a runway of normal NAS width if the crosswind component is at or above the maximum allowable crosswind component recommended by NATOPS.

In my opinion, the best policy is to follow the published NATOPS procedure. Good preflight planning, including careful weather analysis, will minimize those occasions when a landing in marginal conditions is required. If a more suitable runway is not available, the pilot should be prepared to proceed to an alternate.

When I am committed to making a landing in a bad crosswind, I prepare (fuel permitting) for a possible "go around." If I touch down and am not sure I can control the aircraft, I initiate an early waveoff. Quite often the wind conditions are more favorable on a second or third try.

When all else fails, stick to the NATOPS procedures and good luck.

CDR W. J. Rigney, USN

See next letter –

FPO, San Francisco – The "Arcing Downwind" described in July APPROACH, has been helpful to me many times in both crosswind landings and takeoffs. At airfields such as Sheppard AFB, where an alternate isn't that handy, this method can cut the crossing factor from "hairy" to "pucker."

Skyhawk Driver
MAJ W. F. Horner, USMC

HEY, RUNNING DOG! I HEAR YOU CAN VOTE BY ABSENTEE BALLOT!
EAT YOUR HEART OUT, BABY.
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Corsairs and Catwalks

Alameda, Calif. – I've just finished reading the letter from a Green Shirt about the clutter in the catwalks in the June APPROACH. I started to remember the night I jumped off a flight deck full of *Corsairs*, landed on a coil of arresting cable, and sprained my ankle. The thought came to me that some things don't change very much. I see they still have junk in the catwalks and *Corsairs* on the flight deck.

The very next letter gave a good suggestion that would have saved my ankle that night, *high top boots*. Maybe that letter should be re-evaluated. Oh, don't look for my injury in the computer, you'd have to back it up 21 years. That was May 1951 on the "Bonnie Dick," and our *Corsairs* were F-4Us.

Ex-Brown Shirt 414
VF-874

Doorgunners

Washington, D. C. – I am puzzled about your reason for publishing an article such as "Doorgunners Do the Damndest Things" in a publication dedicated to aviation safety. Surely you jest, or perhaps you intended it as a horrible example of how to violate all the rules of safety.

example of how to violate all the rules of safety.

What kind of pilot deliberately banks sharply (and grins) causing his crewman to fall off the helo skid? What kind of pilot flies happily along with a crewman dangling below on a safety strap? What kind of plane commander tolerates such lack of air discipline as this crewman displayed clambering around the outside of the aircraft at altitude? What kind of squadron commander would tolerate such aircrew behavior?

Are you suggesting that naval aviators read this article to pick up some good tips on safe operating procedures? I can't believe it!

It seems to me that an article which reads like a script for "Hogans Heroes" and which displays a basic lack of professionalism is out of place in APPROACH. Let's not glorify unsafe, juvenile behavior which violates all the precepts of aviation safety by publishing such articles – however amusing they may be.

J. Caldwell, CAPT, USN

• "Doorgunners Do the Damndest Things," was a composite of war stories. While not based on any one mission, it offers some insight on the wartime behavior syndrome. If there could ever be an accounting of losses resulting from such immature actions, the list of needless tragedies would probably dwarf bonafide combat losses.

The story was offered as a "break in the routine" – as an amusing but deadly serious bit of narrative. Certainly APPROACH does not advocate such behavior, nor was it intended to offer tips on safe operating procedures. Sometimes a display of nonprofessionalism is recognized as just that by those who might otherwise become participants.

You'll find very few pages in APPROACH not offering at least token mishap prevention. The center-spread of the August APPROACH was no exception.

PRC-63 Radios

FPO, New York – At the present time, our squadron is on an extended deployment aboard a CVS to the North Atlantic where we are frequently involved in flight operations without suitable bingo fields. We are authorized PRC-63 survival radios for each pilot and aircrewman in our *Stoof.* However, when we and our sister squadron placed orders, we were informed that these radios are available only to WESTPAC squadrons.

Is not the survival of our East Coast "fly boys" as important as that of our West Coast counterparts? We want to let "the guys" know when we go down in the cold Norwegian Sea.

Freezingly,

Wannasurvive Mouse

• CNO has taken the philosophy that there will be one radio per aircrewman as an overall Navy goal. However, assets are not now available to achieve this. Three years ago, assets were available to meet the interim goal of one radio per aircrew station for carrier-based aircraft. (COMNAVAIRLANTINST 10470.10 series applies.) This interim goal was met. Since then, attrition of PRC-63 radios due to loss or malfunction has reduced the numbers available. A spokesman for COMNAVAIRLANT states that PRC-63s have not been recalled for shipment to WESTPAC.

The PRC-63 is no longer being procured. Procurement now is for the PRC-90. Some additional deliveries of PRC-90s are expected within the near future. Your best current solution is to procure the URT-33 emergency beacon as a stopgap.

FLIP Changes

Goldstone Deep-Space Communications Antenna

NASA and the Jet Propulsion Laboratory operate an extremely powerful deep-space communications facility at Goldstone, California, coordinates 35° 25.5′N 116° 53′W. *The transmitted power from the facility creates a hazard to all aircraft and must be avoided by at least 5 nautical miles.* Aircraft equipped with EEDS (electro-explosive devices) should avoid the facility by 19 nautical miles. However, Goldstone transmits in only one 20-degree sector at a time. It is this sector in which a hazard exists between 5 nautical miles and 19 nautical miles for EED-equipped aircraft. Therefore, EED-equipped aircraft requiring transit closer than 19 nautical miles should contact Edwards Approach Control to determine the 20-degree sector being used by Goldstone at the time. EED-equipped aircraft may fly as close as 5 nautical miles outside the 20-degree sector in use.

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Vol. 18 **approach** No. 4

RADM W. S. Nelson
Commander, Naval Safety Center
Publisher

Our product is safety, our process is education and our profit is measured in the preservation of lives and equipment and increased mission readiness.

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Credits

Cover drawing by Don Lips places the accent on readiness with the A-7 *Crusader* ready to go. **Pg. 24** Photo Vernon J. Biever, Port Washington, Wisconsin, **Pg. 26** Photo LT Bob Moeller, VF-33, **Pg. 46** Cartoon: AFPS.

FY-72 CNO AWARD WINNERS

CNO "READINESS THROUGH SAFETY" AWARD NAVAIRES/NAVAIRESFOR & 4TH MAW/MARTC

CNO AVIATION SAFETY AWARDS

COMNAVAIRLANT

VF-32
VA-46
VP-26
VA-35
VS-28
HS-7
VR-1
VA-45
RVAH-11
VAW-123

CNATRA

VT-1
HT-8
** VT-28
VT-19
VT-24

COMNAVAIRPAC

VF-111
VA-164
VAQ-135
VAW-116
HS-10
VP-9
VF-124
VC-5

COMNAVAIRESFOR

VF-301 (NAS MIRAMAR)
VA-303 (NAS ALAMEDA)
VS-81 (NAS NORTH ISLAND)
VP-68 (NAS PATUXENT RIVER)
VR-54 (NAS ATLANTA)
HS-85 (NAS ALAMEDA)

CGFMFLANT

VMA-324
HML-167
VMFA-333
VMFAT-201

CG 4th MAW/MARTC

VMA-134
HMM-767

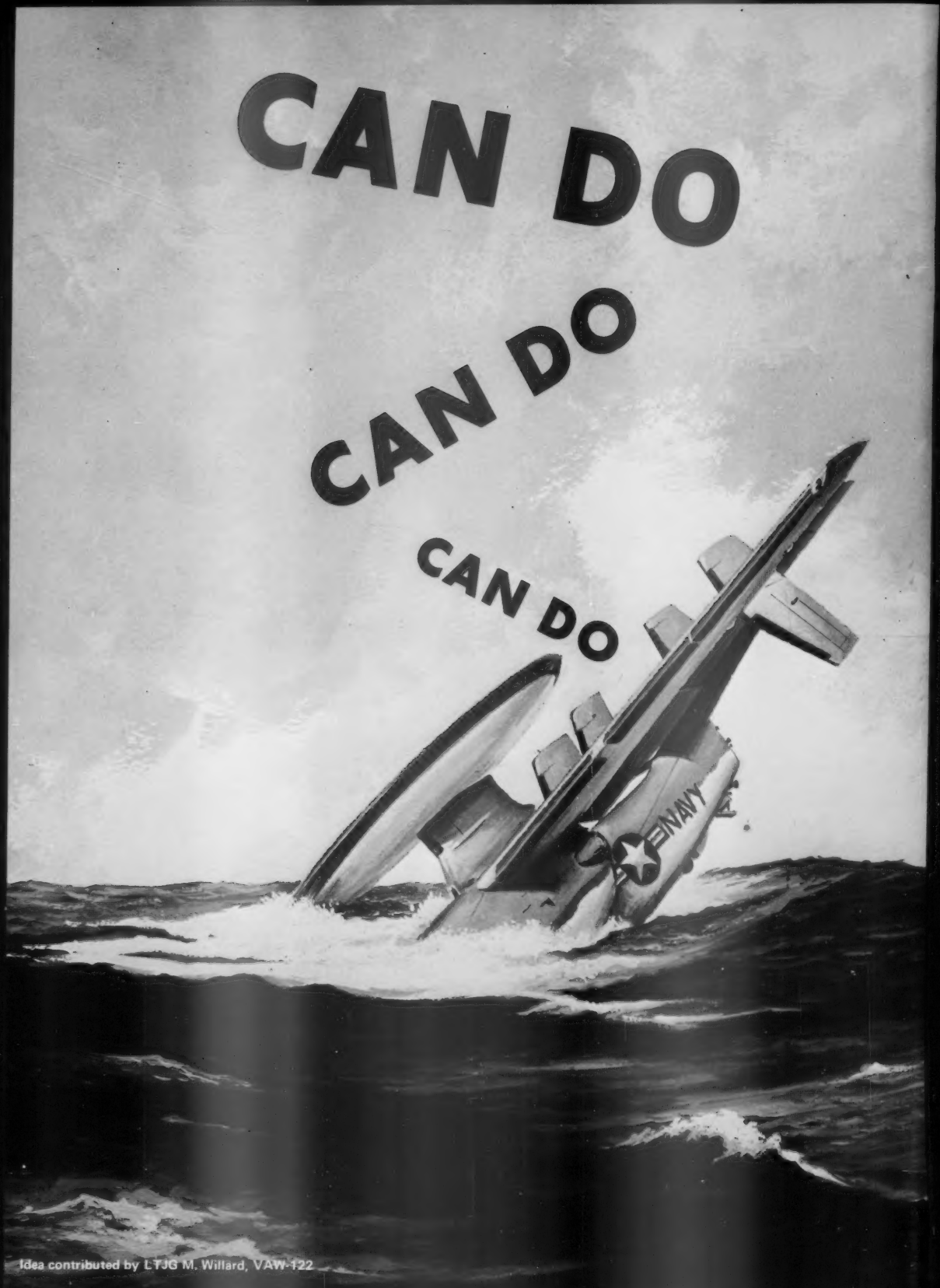
CGFMFPAC

HML-267
* HMM-163
HMT-301
VMFA-531
VMFAT-101

* Second consecutive award.
** Third consecutive award.

ADMIRAL JAMES H. FLATLEY MEMORIAL AWARDS

CVA	CVS	LPH
(Group I) USS SARATOGA (Group II) * USS HANCOCK	USS TICONDEROGA	USS INCHON



Idea contributed by LTJG M. Willard, VAW-122